RAILROAD GAZETTE

FRIDAY, MARCH 31, 1893.

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Contributions.

The Rocket at the Rainhill Trials.

CHICAGO, March 26, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Mistakes in technical and historical matters pertaining to railways are so frequent in the daily press that no one familiar with the subject would waste time to correct them, but when the standard *Railroad Gazette*, in its interesting report of the British railroad exhibits at the World's Fair, says that among other exhibits will be: "A full size reproduction of the "Rocket" *as she appeared at the famous Rainhill trials in* 1829, fresh from Stephenson's factory at Newcastle-on-Tyne and *fitted with the first blast pipe, multitubular boiler and rectangular stayed firebox ever used*," a mistake should be corrected. The "Rocket" had none of these things on the first day of the trials. She did have an improvized blast pipe on the second day, after Geordy had asked Timothy the cause of the "Sansspariel's" regular "puff," the "Rocket's" draft being produced by bellows underneath the tender. Timothy told him he had a "little man in the chimney." The multitubular boiler, the invention of Henry Booth, and the firebox were applied to the engine some time later. The "Rocket" had no firebox at the Rainhill trials. For a correct representation of the "Sansspariel" and "Rocket" of 1829, I refer your readers who visit the Fair to the B. & O. exhibit. The blast pipe was invented by Timothy Hackworth in 1827 and applied by him to the "Royal George" in that year.

LOCOMOTION.

[Comment on this letter will be found on the editorial pages.—EDITOR RAILROAD GAZETTE.]

The Stiffness of Turntables.

Canadian Pacific Railway Company,
OFFICE OF THE CHIEF ENGINEER,
MONTREAL, March 23, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I beg to take exception to a remark in Mr. C. A. Greenleaf's extremely valuable paper "The Evolution of the Railroad Turntable," in your issues of Feb. 10, and March 3 and 10, saying "that all riveted tables will become flexible with use" (see p. 166, March 3). No doubt his published, graphical strainsheets do not give the maxima at every possible point throughout the table for all conditions of loading due to all kinds of rolling stock; for example, a Pullman car, while swinging, would give far greater shears, except for about the central third of the total table length. Partly on this account the writer, in designing a table last fall for the Canadian Pacific, has increased the end depth of the girders to 2 ft. 6 in., instead of 12 in., as in Mr. Greenleaf's table. I also added the whole positive and negative flange strains and those of the shears, and not a fractional part thereof. In providing for flange rivets through web, the resultant of the above described flange strains and shears was used. Besides, to give still greater stiffness during the life of the table, the web was spliced, although no part of it was included in the necessary flange section; also all actual live loads were increased about 25 per cent.

The table referred to is for a 65 ft. pit (although too short for the long Pullmans now in use), and is often of the usual limited depth. Therefore, a half-through plate girder with shelf angles was used, making the top of the upper flanges level with top of rails. The girders are 7 ft. 6 in. apart centres and have a central depth of 5 ft. 6 in., although 6 ft. would be far preferable.

I think this table will meet all the requirements and avoid the objections to tables thus far in use without greatly increasing the weight of the table and its cost.

MAX A. ZUERCHER.

Stored Energy in Car Wheels.

LONDON, March 1, 1893.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In reply to my remarks upon this subject (*Railroad Gazette*, Feb. 10), you give facts and figures which I was expecting and which I was prepared to accept as bearing upon another question on somewhat parallel lines on which, I think, some explanation is required. Suppose a weight of one pound, or any other unit, be moving at the rate of four miles per hour, its stored energy will be represented by $4^2 = 16$. At 60 miles an hour, by this same reasoning, the stored energy will be equally represented by the figure $3{,}600 = 60^2$.

At 64 miles per hour the same rule gives 4096. Between 60 and 64 miles the difference is 496, and yet the energy of 4 miles velocity is only 16. Now what I wish to ask is this: Suppose, in a train traveling at 60 miles per hour velocity, a passenger, whose stored energy is, like the car in which he travels, represented by 3600, begins to walk in the direction of travel at the rate of 4 miles per hour, what is now his stored energy? Is it to be represened by 3600 + 16 = 3616 or by 3600 + 496 = 4096? Does it, in fact, stand good that the passenger, who walks forward in the moving train, adds 31 times the energy to what has already been put into him, that he adds when he walks along the train as it stands at rest? If he does add this large amount, must he not experience very great difficulty in getting up a speed of four miles per hour relative to the car? It will be acknowledged, I suppose, that his movement through space at 64 miles velocity accounts for a stored energy of 4096, and yet we never hear of passengers being glued fast when trying to add a few miles velocity to the 40 or 60 miles at which they have been set off by their attachment to the car. This opens up quite a large field for investigation. For example, what about the motion of the piston and side rods of the locomotive? Can it be shown that their stored energy is compounded of $V^2 + v^2$ or represented by $(V + v)^2$. On the answer to this depends our knowledge of the stresses on the pins and upon a correct knowledge of this depends surely a correct knowledge of the whole question of locomotive balancing. In one case one can balance a locomotive just as it would be balanced if run on friction wheels in the erecting shop; in the other case there can be no reliance placed on this long accepted method. What troubles me in the matter is the passenger who, in a train at 60 miles per hour proceeds to walk at 4 miles per hour backward. He reduces his store of energy from 3600 to $56^2 = 3136$; that is, by 464. If this does not flatten him up against the rear door with 20 man power, why is it?

I want an explanation of this subject, something to show how the passenger stores up the energy difference between 60 and 64 miles velocity with no greater power expenditure than if he stored up the difference between 0 and 4 miles, if so it be that he does use no greater exertion in doing so, a matter which I cannot prove myself in English cars.

AMERICUS.

[If one is seated in a car, whether the car is in motion or at rest, the stored energy of his body relatively to the car is zero. If now one starts forward or backward to accelerate his body by walking until a speed of four miles an hour relative to the car is reached, the stored energy of each one pound of weight of his body relatively to the car becomes 0.52 ft.-lbs. But relative to a fixed point on the roadbed, the resulting stored energy is quite another matter as we shall see. At rest in the car each pound of one's body has the same amount of stored energy that the same weight of the car has. If the car is not in motion, this is zero; if the car has a velocity of 60 miles an hour, it is 120.25 ft. lbs. At 64 miles an hour this becomes 136.72 ft. lbs. If the car has a velocity of 60 miles an hour and the passenger walks in direction of travel at the rate of 4 miles an hour, each pound of his body has 136.72 ft. lbs. of stored energy relatively to a point in the roadbed; but relatively to the car it has only 0.52 ft. lbs. This last is the energy added by the passenger himself during the period of acceleration, and he has no more difficulty in accelerating himself to a speed of 4 miles an hour on a car when the car is moving than when the car is standing. The difference between the quantities 120.25 and 136.72 is 16.47, and is the energy added to each unit of weight of the passenger while he is accelerating himself in the direction of travel to a relative speed of 4 miles an hour on a car already running at 60 miles an hour. Of this differential amount the passenger adds 0.52 ft. lbs. The remainder is the work done by the locomotive on each pound of his body during the acceleration period that the passenger is pushing back on the car when walking. From this it will be seen that, with a sufficient number of passengers all walking on a car in the direction of motion of the car, its speed might be reduced considerably. Were the same passengers to walk in the opposite direction they would assist the locomotive during the acceleration period, but not after uniform motion is reached. "Americus" can have a very simple illustration of the effect on the locomotive of the passenger walking in the car if he will stand on a small handcart or sled, and while some one hauls it step off at the rate of four miles an hour. He will find that there is considerable increased resistance while he is stepping off if he does so in the direction of travel, and, to the contrary, if he starts in the opposite direction, he will push the vehicle against his companion's heels. The above explanation may set our correspondent right on the question of movement of pistons and rods and the counterbalancing of them; also it will show him how little mystery there is in all this matter. These questions are frequently given as catch problems to technical students.—EDITOR RAILROAD GAZETTE.]

Brakebeam Hanger Bracket and Centre Hanger.

Fig. 1 shows a brakebeam hanger bracket that extends from top to bottom flange of the transom channel in such a way that the flanges take the severe vertical thrust due to braking, while the rivets serve only to hold the bracket to the channel, and thus are never in full shear, and are never subject to great tension.

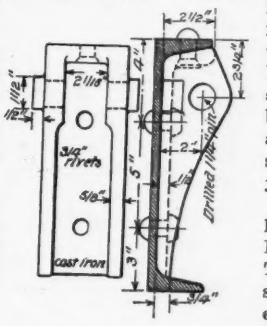


Fig 1.—Brake Hanger Bracket.

Fig. 2 shows the centre hanger used with the Kewanee brakebeam. This hanger is sufficiently strong to afford all necessary support to the beam, and also is flexible enough to allow the brake shoes to bear fairly upon the wheels. This arrangement is used on all of the new freight car equipment of the Chicago, Burlington & Quincy Railroad. It was adopted after a preliminary trial of about two years.

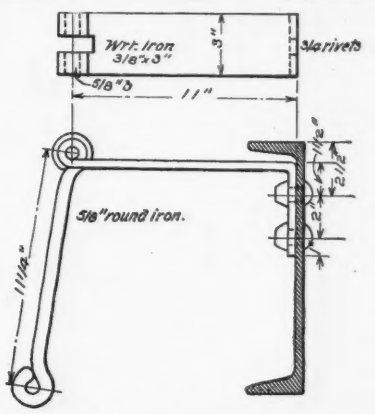


Fig. 2—Centre Hanger for Kewanee Brakebeam.

The New Union Station in Boston.

The fact that the Boston & Maine Railroad Company is about to build a new station in Boston, in place of the one now in use, has been stated in the *Railroad Gazette* as has also the additional fact that a contract has been made by which the Fitchburg Railroad will occupy the building for its passenger business. A union station for the accommodation of these four northern railroads has been talked about so long that Boston people can hardly realize that work has actually begun, and that before midsummer trains will be running in and out of the new station. Of course it is not expected that a magnificent new building with all the appointments of a passenger station for a large railroad system will be erected in three or four months, but the plans indicate quite a substantial looking brick edifice that will well serve its intended temporary purpose, and the track accommodations will be all that could be desired.

Such accommodations, too, are absolutely needed, for the new station will see a larger traffic than any other station in the country. A Philadelphia paper not long since claimed that the Broad street station of the Pennsylvania Railroad, with its 530 trains a day and a total of 20,000,000 passengers last year, was far ahead of any other railroad station in the United States. Great as this record was, the railroads that will occupy this new station far exceeded these figures, for during the year ending June 30 last the Boston & Maine handled no less than 22,443,270 Boston passengers, and the Fitchburg took care of 4,197,658, making a total of 26,640,928 passengers taken in and out of Boston. At the present time these same roads run 551 trains daily in and out of that city, and in the summer time the number is still

larger, not counting extra or excursion trains. This year will undoubtedly show about the same increase over last year as that did over the previous year—1,600,000; and if so the new station will open in July with a demand for accommodations for over 77,000 passengers a day the year round.

With such an enormous traffic it is no wonder that the officials believe it will need the 22 tracks that are to be provided for passenger trains in the new station; and to one familiar with the huge piles of baggage that fill every available space in the present stations, and that overflow upon the platforms in the height of the summer travel, it is easy to understand why two big baggage rooms, each 300 ft. long by 40 ft. wide, are to be erected.

A floor plan of the proposed station was published in the *Railroad Gazette* of Jan. 13, but since then the agreement to admit the Fitchburg Railroad to the new station has been made, and as a result the plans have been considerably changed and enlarged, and even now

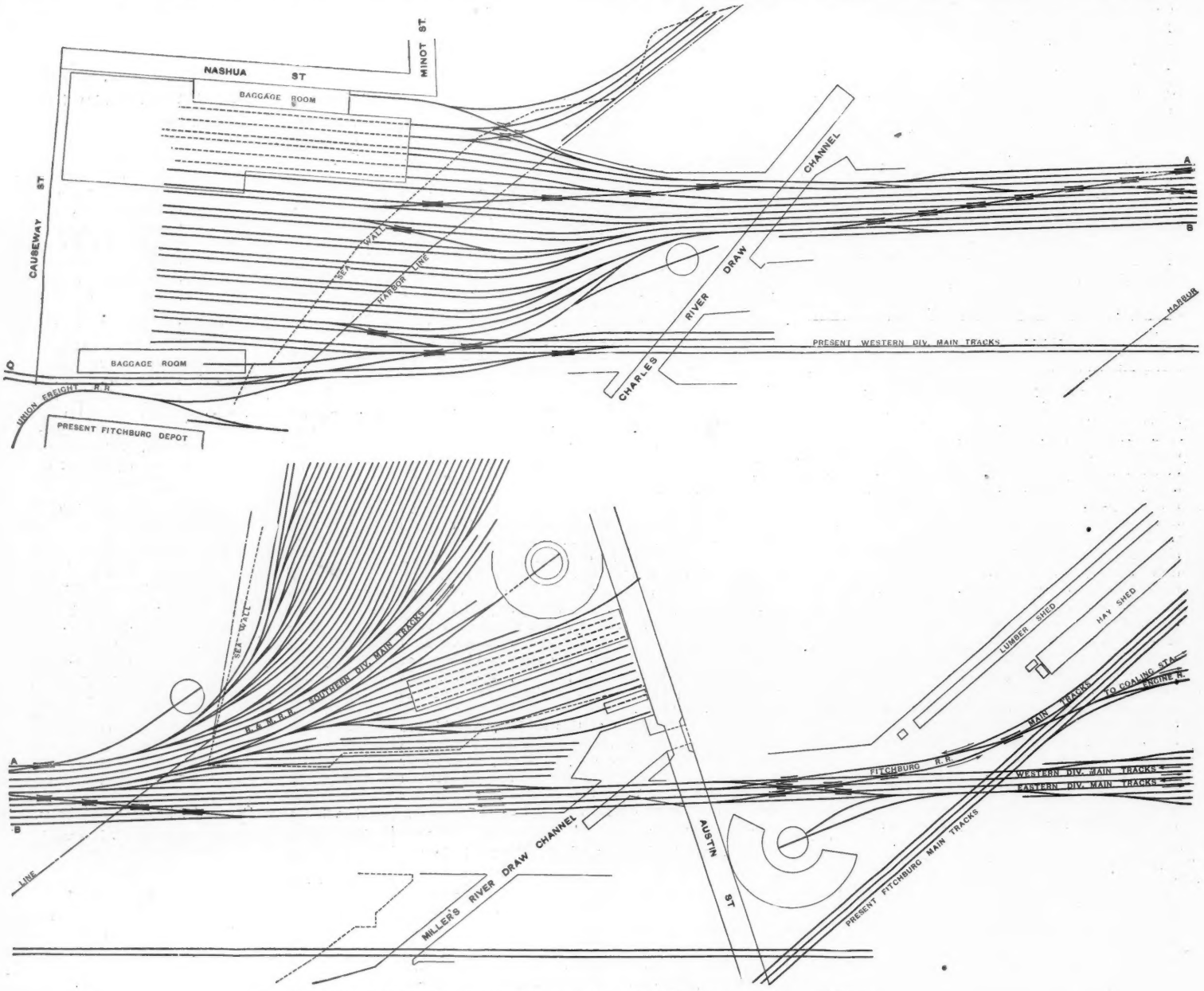
next to the present station, while beyond it will be the ticket office, telegraph office, newsstand, etc., and beyond those a large general waiting room. The 16 new tracks to be constructed in the rear of the new portion of the Union station are not to be covered. They will be arranged mostly in pairs, and between every two pairs there will be a covered platform 20 ft. wide. This arrangement of the tracks will be clearly seen by an examination of the accompanying plan, which shows them from the station out to the crossing of the present tracks of the Fitchburg Railroad.

A seawall runs in a diagonal line varying from 480 to 800 ft. from Causeway street, and some 650 ft. beyond is the channel for vessels to pass up Charles River. The tracks over this territory will occupy a tract some 590 ft. wide. Most of this tract is covered with a pile structure, but a portion, being open water, will have to be piled before tracks are laid. Work is being pushed as rapidly as possible.

At present the tracks of both the eastern and western

tracks alternating, each road would practically have less available room in emergencies than when all are worked as one. And the crossing of trains by switches instead of by frogs will be accomplished with less delay, because there are two or three places where a train can be crossed. Thus, an inward train from the Eastern Division which would naturally cross the path of an outward Fitchburg train at the crossover opposite *A* can if a Fitchburg train is likely to hinder it at that point, be crossed at the switches near Austin street.

As previously stated, there are to be 22 passenger tracks in the Union station, besides tracks for the baggage cars. These tracks vary in useable length, a few being 320 ft., others 960 ft., while the majority are about 700 ft. long before cross-overs are met with. All these tracks gradually merge into eight, and thus they cross Charles River draw channel, which is 35 ft. wide. The tribulations of a vessel seeking passage up or down the river will be enough to try the patience of a Job, for the opportunities for opening the draw will be rather



NEW PASSENGER TERMINAL OF THE BOSTON & MAINE AT BOSTON.

The two parts of the diagram join at A B. Tracks are indicated by single lines. Q indicates the track leading to the Old Haymarket Square Station.

the architects have not completed their drawings. The work of preparing the ground for the new structure is going rapidly forward, and a small army of men with engines, steam shovels, pile drivers, etc., and attended by the inevitable sidewalk brigade of spectators, make the scene exceedingly lively.

It is a curious fact that every terminal passenger station in Boston is on made land, and hence, before building, piles have to be driven for the foundations to rest upon. The spacious station built some twenty years ago by the Boston & Lowell at a cost of about one million dollars came into possession of the Boston & Maine when it leased the Lowell road. This is to form the western side of the Union station. The headhouse is some 200 ft. wide, 150 ft. deep and four stories high; while the trainhouse in the rear is 120 ft. wide and 480 ft. long, covered by a magnificent arch roof of iron and glass. The new station to be added on the east of this building will be of brick, extending along Causeway street about 360 ft., and about 160 ft. deep. The total width of the new station will therefore be some 560 ft. The eastern corner will have a tower, and the entire new part will be somewhat in harmony with the old building, though not as lofty. There will be a spacious covered cab stand

divisions of the Boston & Maine cross the Fitchburg at grade a little less than a mile out; and about a mile beyond this the Eastern Division tracks cross those of the Western Division at grade. By the new arrangement these grade crossings will be done away with, though a large portion of the trains will still have to cross each other's paths substantially the same as at present, for the inward trains must all go to the southern half of the station, and the outward will all start from the northern half.

According to the locations of the several railroads, after crossing Charles River the trains of the Southern Division would naturally enter and leave the station on its western side, those of the Fitchburg road would be next, those of the Western Division would come next, and those of the Eastern Division would be on the extreme eastern side. (The tracks of the Southern Division cross the Fitchburg road on an overhead bridge.) But the advantage of having outward trains separated in the station as completely as possible from the inward is too great to be sacrificed. Besides the avoidance of confusion at the doors and passageways, baggage rooms and other places, the economical use of spare track room is an important element. With inward and outward

scarce between the hours of 6 a. m. and midnight. On an average, a train will cross the draw every two minutes. Should a vessel chance to become stuck in the draw, for any length of time there will be a big stoppage of passenger trains. In such a case the present main tracks of the Western Division of the Boston & Maine, which cross the Charles about 240 ft. east of the main route, may possibly be utilized to relieve the blockade, though at great inconvenience, of course.

It will be noted that the plan shows a large territory at the junction of the Southern division to be covered by some 30 tracks for the storage of passenger cars, but with the enormous traffic of the Boston & Maine this territory will all be needed.

The Fitchburg road will pay interest upon the cost of the terminal in proportion to its business. The Boston & Maine will have the right to buy the old Fitchburg passenger station and all that company's property south of the Charles River. The Fitchburg agrees not to run trains between 7 and 9 a. m. or between 5 and 7 p. m. crossing the passenger tracks, unless it be necessary to reach a steamer.

The Boston & Maine has contracted with the Union Switch & Signal Company for the signaling. The con-

tract covers the tracks from Causeway street to beyond the present Fitchburg grade crossing. The pneumatic system will be used, and at the drawbridge the pneumatic tubes will be carried down under the river. There will be an independant power plant furnishing the electricity and compressed air for the operation of the signals and switches. There will be two towers, one near the Charles River drawbridge on the Charlestown side, and one near Fitchburg Junction. There will be two principal signal bridges and several subordinate ones, and from the two towers there will be operated 172 switches and 27 sets of movable frogs.

In a recent report to the rapid transit committee of the legislature, Mr. Thomas Doane, the well known engineer, has given a summary of estimates of the cost of elevating the tracks of the several railroads entering Boston on the north, of building a bridge across Charles River for their joint use, and of bringing them together in a union passenger station at the corner of Causeway and Leverett streets (west of the station here shown), in accordance with the plan prepared by him for the railroad commissioners a year ago. His figures are:

Net cost of land for site of the union station	$1,396,925
Cost of Charles River Bridge	1,750,000
Elevating tracks of B. & M. and Eastern, joint construction	1,404,392
Elevating tracks of Boston & Lowell and Fitchburg, joint construction	828,972
Elevating tracks of Fitchburg, separate construction.	477,357
Total	$5,767,646

By his plan 41 grade crossings would be abolished.

One of the Earliest Locomotives.

We have received from Mr. H. G. Young, Second Vice-President of the Delaware & Hudson Canal Company, a photograph of the locomotive "Angenoria," which is reproduced in the engraving herewith. We regret that the print does not show quite all of the locomotive, in that it lacks the top of the smokestack; but it does show the essential parts of the engine and as an authentic picture of one of the earliest locomotives ever built it is very interesting. Concerning this engine Mr. Young writes as follows:

"The locomotive 'Angenoria' was built by Foster, Rastrick & Co., of Stourbridge, England, in 1829. This firm were at the same time constructing the 'Stourbridge Lion' for the Delaware & Hudson Canal Company and the two locomotives were originally of the same pattern. The manufacturers had the 'Angenoria' in use at their colliery for 30 years, during which time it became necessary to remove the wooden wheels and substitute iron wheels, and some other less important changes in its mechanism were also made. This engine has long been out of use, but it is preserved by the successors of its manufacturers as an interesting historic relic, and being the sister engine of the 'Stourbridge Lion' it preserves to us the authenticity of that engine also, which, as we have claimed by substantial proof, was absolutely the first locomotive that ever turned a driving wheel on the American continent.

"The inclosed photograph is a copy from a photograph made on the premises of the successors of Foster, Rastrick & Co., of Stourbridge, England, who kindly sent us a copy at our request."

The reader will remember that the "Stourbridge Lion" and two other locomotives were ordered in England by Mr. Horatio Allen under the instructions of Mr. John B. Jervis, who was at that time Chief Engineer of the Delaware & Hudson Canal & Railroad Company. The "Stourbridge Lion" arrived in New York in May, 1829, where Mr. Allen, who had ordered it, was waiting for it, and under whose directions it was set up. Mr. Jervis in one of his letters says: "Only the 'Lion' was set up. It worked very well and no doubt would have done good service had the trestle-work been sufficient to sustain the weight of the engine. It was the intention of having engines of 1¼ tons on a wheel as the heaviest, but when the machine was constructed it was found to have nearly two tons on a wheel, and this the road was not designed for." A letter from Mr. Allen dated New York, May 17, 1829, says: "The 'John Jay' has arrived. On Monday the engine is to be landed and sent to the Kemble's establishment.' The experimental run of the "Stourbridge Lion" was made in August, 1829, somewhere between the 3d and 8th of that month, and this was the first time that a locomotive ever turned a wheel on the continent of America.

The reader who is curious in these matters can find a good deal of information in the history of "The First Locomotives in America," by William H. Brown, published by D. Appleton & Co., New York, in which a picture of the "Lion" is given.

Railroad Matters in the Legislatures.

The bill prescribing regulations for the punishment of refractory witnesses was passed by the last Congress, but those defining the word "line" and making the tariff files of the Interstate Commerce Commission prima facie evidence in judicial proceedings failed. The bill abolishing punishment by imprisonment for secret rate cutting also failed.

In Connecticut the state pays the railroad fares of the members of the legislature under a law of 1889, and as this takes a good deal of money a bill has been reported to repeal the law, but it was laid on the table. In Minnesota a bill to tax two million acres of railroad land has been rejected by a vote of 30 to 20.

The Texas Legislature has been considering a bill to prohibit ticket scalping, and the lower house has passed a bill requiring separate passenger cars for negroes. In Wisconsin it is reported that "the Assembly Committee on Railroads met Friday morning and advised with the St. Paul company's lobbyist for a short time, after which five anti-railroad measures were consigned to death." These were: A measure providing for an appraisal of the railroads of the state for the purpose of fixing freight and passenger rates; one requiring guard gates at all road and street crossings of railroads; one regulating the stoppage of trains, Mr. Van der Heiden's compelling trains to stop at certain stations, and Mr. Lange's fellow-servant bill.

A petition has been presented to the Massachusetts Legislature asking that railroad corporations be compelled to sell new stock at public auction where its market value exceeds the par value. It is signed by the official representatives of the Massachusetts Board of Trade, the Boston Merchants' Association, the Boston Associated Board of Trade, the Shoe and Leather Exchange, the Bay State Lumber Association, the Boston Board of Fire Underwriters, the Master Builders' Association, the Boston Chamber of Commerce, the New England Furniture Exchange, the Fruit and Produce Exchange, the Massachusetts Retail Lumber Dealers' Association and the New England Paint and Oil Club. The question involved is thus clearly presented:

Stock watering is always contrary to public policy and in its direct form is positively forbidden by law. It consists in a corporation parting with its stock without receiving full value for it. The form in which this is done is immaterial. If the stock of a railroad requiring an additional $10,000,000 for new plant is worth, and sells for, $200 per share, precisely the same result follows, whether,

1. The road issues and sells 50,000 shares at its value, $200 a share, producing the $10,000,000 needed, and then gives its stockholders a direct stock dividend of another 50,000 shares, which they sell for another $10,000,000, and put this into their pockets; or,

2. The road issues the whole 100,000 shares to its own stockholders at half its value (that is, $100 a share), and puts the $10,000,000 thus received into its treasury, while the stockholders sell this stock in the market at its value ($200 a share) and put the resulting $10,000,000 profit into their pockets.

The first is distinctly forbidden by law and subjects directors responsible for it to criminal penalties by fine upon indictment; the second is the indirect way of accomplishing precisely the same result, and is only possible because of an anomaly in our laws. It was forbidden by law until presumably interested parties caused the repeal of the law.

The Railroad Committee has agreed upon a bill requiring the sale of stocks at auction, which will be favorably reported. There is a section empowering the railroad commissioners to regulate the principal details of such sales. The Massachusetts Legislature has discussed at great length the silly bill regulating the hours of labor on railroads. It was finally rejected by the Senate, but only by a small majority, 16 to 13.

The bill in the Illinois Legislature to indorse the Chicago scheme for elevating all the tracks of the city has been rejected in the lower House by a vote of 74 to 44. Governor Waite, of Colorado, has vetoed the bill which was passed in that state to abolish the present railroad commissionership and establish a new commission of three members. Apparently the Governor thinks the legislature does not "regulate" the railroads with sufficient severity.

British Iron and Steel Production.

The *Bulletin* of the British Iron and Steel Association, Mr. J. S. Jeans, Secretary, announces the make of pig iron for 1892 as 6,616,890 tons. This is 611,686 tons less than the production of 1891. The largest make, 1,937,469 tons, was in the Cleveland district, but the make there for last year was 685,263 tons less than the year before; whereas, the Scotch make increased by 302,788 tons. The Scotch had their strike in '91, and the East Coast people in '92. The stocks of pig iron, excepting that in the hands of one important firm, are 872,895 tons, showing a decrease of 360,182 tons.

The products of pig iron in this country, England, Germany and France, the two first in gross tons and Germany and France in metric tons, for the five last past years have been as follows:

Year.	United States.	United Kingdom.	Germany.	France.
1888	6,489,738	7,898,634	4,337,121	1,688,976
1889	7,603,642	8,245,336	4,387,504	1,733,964
1890	9,202,703	7,875,130	4,637,239	1,970,160
1891	8,279,870	7,228,496	4,452,619	1,897,387
1892	9,157,000	6,616,890	4,793,003	2,022,989

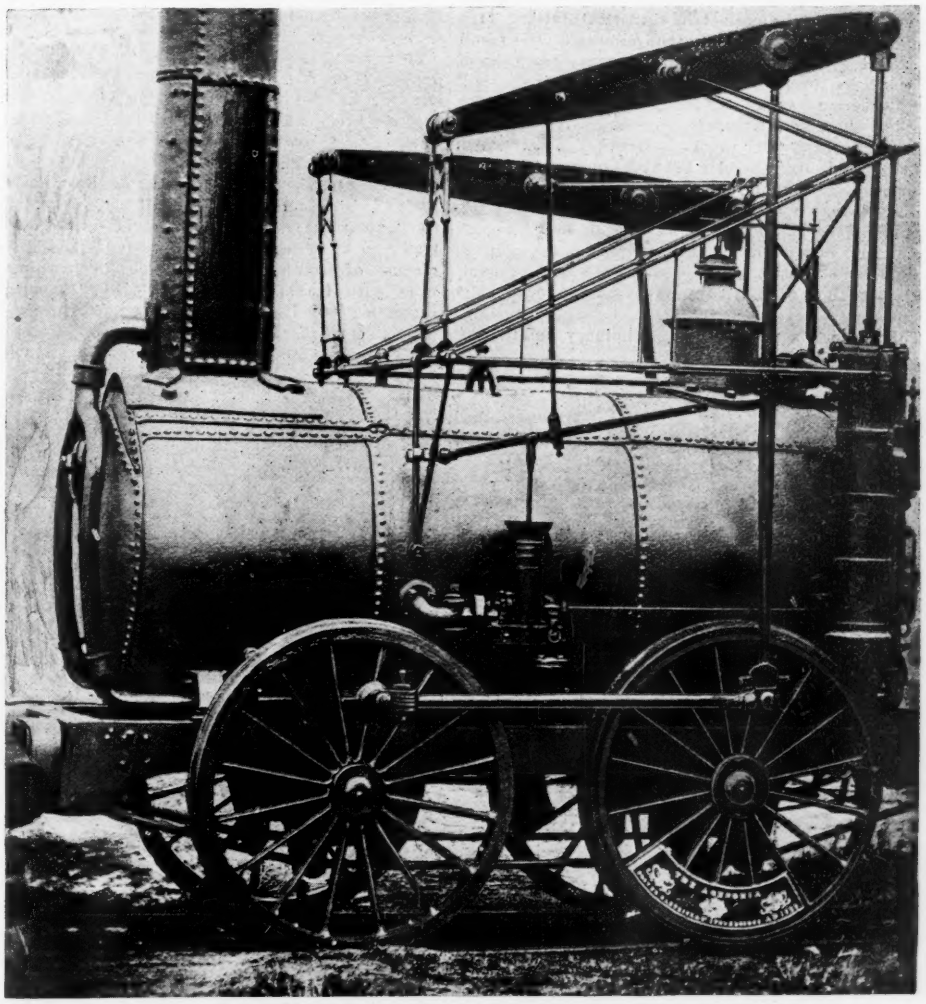
It will be noticed that our proportion of the aggregate make of the three countries has increased from 31.8 per cent. in 1888, to 43.6 per cent. last year, and that of France from 8.2 per cent. to 9 per cent. in the same time, Germany having lost ground relatively and the United Kingdom absolutely.

The production of Bessemer steel ingots for last year was 1,500,810 tons, a decrease of 141,195 tons, as compared with 1891. Of this year's production 1,202,027 tons were acid and 298,793 tons basic. The steel rail production was 535,836 tons as compared with 662,676 in 1891.

The production in the two countries of ingots and rails has been, in gross tons:

	1891.		1892.	
	Ingots.	Rails.	Ingots.	Rails.
United States	3,247,417	1,239,593	4,160,972	1,458,743
United Kingdom	1,642,005	535,836	1,500,810	662,676

Of the Bessemer steel made in Great Britain only 298,783 tons were basic, showing a decline of 7 per cent. England is the only country in which the acid process seems to be gaining on the basic. In Germany the increase has been 13½ per cent., so that the basic output in January is considerably greater than the total



THE LOCOMOTIVE "ANGENORIA."

Built by Messrs. FOSTER, RASTRICK & CO., *Stourbridge, England*, 1829.

Bessemer make in England. Austria-Hungary has increased its total by 30 per cent.; that is, these countries are relying more on native ores, while England is increasing its importations of Spanish and other ores.

The centre of gravity of the Bessemer steel production has changed greatly during the past 20 years. The figures for 1890 are so far perfect that the following table is substantially correct.

Relative production of Bessemer steel ingots, percentage of total make:

Jan.	United States.	United Kingdom.
1870	7.45	42.8
1873	13.0	42.5
1875	20.0	37.1
1877	23.5	35.2
1880	29.12	28.34
1885	31.28	26.9
1890	42.6	23.22

When the figures for 1892 are made up it is probable our percentage will be very near 45, if not over that figure.

Results of Railroad Operation in 1892.

The Statistician of the Interstate Commerce Commission, Prof. Henry C. Adams, has prepared what is called a Preliminary Report on the Income Account of the Railroads of the United States for the year ending June 30, 1892. He says that with this publication begins a new feature of the work of the statistical division of the Commission, that of furnishing the public with the result of rapid compilations of railroad statistics. The attempt is certainly an admirable one, and its success will remove serious ground of complaint concerning the work of the Commission, the delay in getting the facts before the world. The report is dated Dec. 1, at which time it was probably handed in to the Commission, and it reached our desk March 27. It seems, therefore, that with reasonable promptness in the Government printing office the public might have been in possession of the facts now published two or three months ago; but as it is, the statistics of the Commission will probably anticipate those of Poor's Manual by four or perhaps five months.

This report is put forth as preliminary, and there is no intention of giving up critical examination of the railroad reports before they are passed for final compilation, and the figures now presented are probably subject to some correction. The results of operation on 462 railroads, covering 128,350 miles, are given, and in the first table presented there is a column giving the estimated results for 165,000 miles. This table we reproduce in full (Table I.). It will be observed that in 1892, as compared with 1891, there is an increase in gross earnings per mile of line operated of $608, which is in excess of the increase in any year covered by reports to the Commission. Professor Adams accounts for this in large measure by the fact that in 1891 the railroads were moving the poor crop of 1890, while in 1892 they were moving the abundant crop of 1891. The increase in revenue from freight was more rapid than from passengers. In 1892 the passenger earnings were 29.81 per cent. of the total and in 1891 they were 30.37 per cent., but the freight earnings in 1892 were 68 per cent. of the total, and they were 67.45 per cent. in 1891. The ratio of operating expenses to gross earnings in the several years, as indicated in this table, has been: 1892, 66.64 per cent.; 1891, 66.72 per cent.; 1890, 65.79 per cent, and 1889, 66.82 per cent.

A second table gives statistics by the territorial groups which have been adopted by the Commission, and we select certain figures from this table for reproduction (Table II). The table in full gives the following facts for the years 1892 and 1891: Gross earnings from passengers, from freight and miscellaneous, operating expenses and net earnings. These are given in total and per mile of line operated. The proportion of each item to total earnings is also given.

Gross earnings per mile increased in all the groups reported on. The figures for group IV. are omitted as the data received for 1892 are not sufficiently complete to warrant publication. The greatest increase in gross earnings is in group III. Group VI. shows the next greatest increase. It will be observed that net earnings per mile have increased in groups VI., VII., VIII., IX., and X., and have decreased in groups I., II., III., and V. Professor Adams points out that three of the four groups which show the largest increase of gross earnings show a decrease in net; and in two of these groups, namely, II. and III. lie the great trunk lines running from Chicago to the seaboard.

There are 80 railroad companies each of which has a gross revenue of more than $3,000,000. A table is given showing for 62 of these railroads the gross and net earnings per mile of road and the passenger and freight traffic per mile of road. These data are given for the years 1890, 1891 and 1892. The gross earnings included in this table amount to 65 per cent. of the total estimated revenue of all the railroads of the country. The table presents, therefore, a comprehensive view of the density of traffic in the three years reported on, and gives the means of comparing variations of earnings per mile with traffic per mile. In 1890 those of the roads in group II., which are included in the table above, carried 1,900,295 ton-miles of freight per mile of line. This fell in 1891 to 1,763,330 ton, miles and rose again in 1892 to 1,935,404 ton-miles. The same relative density of traffic in the three years is shown in the roads of group III. Passenger business during the three years shows a slight increase for these same railroads, but in this respect the result is not as satisfactory as with the railroads in the New England group, where the relative increase in passenger business is much greater. The influence of poor crops in 1890 and good crops in 1891 is shown also by the relative density of freight traffic in the lines included in group VI. In group V. there is a continuous increase in the density of the traffic since 1890. The freight mileage per mile of road in 1890 for this group was 394,096. In 1891 it was 405,905, and in 1892 it was 499,926. The passenger business fell off in 1891 but gained again in 1892.

Another table, filling 64 octavo pages, gives the income account of all the railroads reporting; that is, of nearly 1,800 companies for the year ending June 30, 1892. In this table the results are also footed up by groups. There is no table precisely like this in the statistical reports of the Commission for former years, it being in form a compilation and condensation of one or two of the tables as published heretofore. It has 14 columns, giving for each road miles operated, gross earnings from various classes of business, operating expenses, net earnings, other income, total net income, fixed charges, net income available for dividends, dividends and other payments from net income, and surplus from operation. Of course it is understood that under the 1,782 titles many subsidiary companies are included.

The two small tables (III. and IV.) are interesting. It appears that there are 11 railroads, including the Canadian Pacific, each of which enjoys an income exceeding $20,000,000. These in the order of gross revenue are given in table III.

TABLE I.—RESULTS OF OPERATIONS, YEAR ENDING JUNE 30.

	1892. Compiled 128,349.99 miles.	1892. Estimated 165,000 miles.	Estimate increased of 1892 over 1891.	Per mile of line operated. [1] 1892.	[2] 1891.	[3] 1890.	[4] 1889.	Increase of 1892 over 1891.
Gross earnings:								
Passenger	$283,528,205	$364,525,849	$31,500,038	$2,209	$1,962	$1,978	$1,956	$247
Freight	646,633,345	831,301,576	91,506,671	5,038	4,689	4,589	4,204	349
Other	20,716,635	26,634,912	2,817,215	161	150	155	127	11
Unclassified	[5] 146,974	18,961	126,379	1	.....	3	3	1
Total	951,025,159	1,222,711,608	125,970,303	7,409	6,801	6,725	6,290	608
Operating expenses	633,690,830	814,722,082	82,834,189	4,937	4,538	4,425	4,203	399
Net earnings	317,334,323	407,989,616	43,116,114	2,472	2,263	2,300	2,087	209

[1] 128,349.99 miles of line; [2] 161,275.17 miles of line; [3] 156,401.06 miles of line; [4] 153,385.87 miles of line; [5] covers two roads making no classification of "earnings" under the several heads.

Territorial Grouping of the Railroads of the United States.

TABLE II.—EARNINGS AND EXPENSES PER MILE, 1892 AND 1891.

Group I.

	1892.	1891.
Gross	$11,613	$11,204
Operating expenses	8,085	7,787
Net	3,528	3,417
Per cent operating expenses	69.62	69.50

Group II.

	1892.	1892.
Gross	$15,931	$15,356
Operating expenses	10.559	9.903
Net	5,372	5,453
Per cent. operating expenses	66.28	64.49

Group III.

	1892.	1891.
Gross	$8,732	$7,910
Operating expenses	6,146	5,484
Net	2,586	2,426
Per cent. operating expenses	70.38	69.33

Group V.

	1892.	1891.
Gross	$5,203	$4,854
Operating expenses	3,603	3,347
Net	1,600	1,507
Per cent. operating expenses	69.24	68.95

Group VI.

	1892.	1891.
Gross	$6,076	$5,426
Operating expenses	3,938	3,481
Net	2,138	1,945
Per cent. operating expenses	63.98	64.16

Group VII.

	1892.	1891.
Gross	$4,928	$4,575
Operating expenses	2,963	2,908
Net	1,965	1,667
Per cent. operating expenses	60.12	63.57

Group VIII.

	1892.	1891.
Gross	$4,864	$4,465
Operating expenses	3,346	3,093
Net	1,518	1,372
Per cent. operating expenses	68.80	69.26

Group IX.

	1892.	1891.
Gross	$4,645	$4,408
Operating expenses	3,560	3,434
Net	1,085	974
Per cent. operating expenses	76.64	77.90

Group X.

	1892.	1891.
Gross	$6,283	$5,892
Operating expenses	3,874	3,749
Net	2,409	2,143
Per cent. operating expenses	61.65	63.62

TABLE III.—ELEVEN RAILROADS EARNING MORE THAN $20,000,000 EACH.

Road.	Earnings.
Pennsylvania	$68,260,901
Southern Pacific Co.	47,480,962
New York Central & Hudson River	44,241,788
Chicago, Milwaukee & St. Paul	32,419,306
Chicago & Northwestern	32,061,757
New York, Lake Erie & Western	31,692,912
Chicago, Burlington & Quincy	31,223,850
Northern Pacific	24,911,636
Lake Shore & Michigan Southern	22,559,995
Delaware, Lackawanna & Western	21,761,986
Canadian Pacific	21,032,120

TABLE IV.—EIGHT ROADS EARNING MORE THAN $20,000 A MILE EACH.

Road.	Earnings per mile.
Delaware, Lackawanna & Western	$27,607
Pittsburgh & Lake Erie	26,379
Pennsylvania	25,866
Boston & Albany	25,376
New York, Providence & Boston	23,159
New York, New Haven & Hartford	22,654
Central R. R. of New Jersey	21,689
New York Central & Hudson River	21,266

The average gross earnings per mile for all the railroads included in this preliminary report are $7,400; 31 of the roads have a less revenue per mile than this. Thirteen have a revenue varying from $7,443 to $13,000 per mile of line; 10 have a revenue varying from $13,000 to $20,000 per mile, and 8 a revenue greater than $20,000. These 8 are given in table IV.

A German Track Marker.

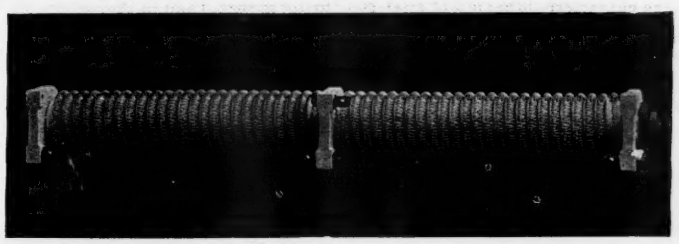
An automatic device for locating, and clearly marking track defects on an existing line of railroad has been brought out by G. Mack, of Nuremburg, Germany, Chief Engineer of the Bavarian State railroads. It apparently follows Mr. P. H. Dudley's notion, but is less positive in its action. The principle of the apparatus is based on the fact that every low point or other similar defect in a line of track causes a shock of greater or less intensity in a car passing over it. The arrangement of the apparatus in the inspection car is such that if the shock exceeds a certain degree of intensity a squirting device is brought into operation from which either a red or blue liquid, depending on the violence of the concussion, is squirted over the roadbed, making stripes from 1 ft. to 7 ft. long, and about 2 in. wide. The track sections requiring the attention of the roadmaster are thus very plainly marked. One such squirting device is arranged on each side of the inspection car. The apparatus, it is claimed, will locate defects which cannot ordinarily be detected by the track walker, and will afford evidence of imperfections in the roadbed long before these will show themselves by such signs as batterod rail ends at joints, and the like.

Electric Car Heaters.

The Consolidated Car Heating Co., of Albany, N. Y., have recently introduced an electric heater, invented by Mr. James F. McIlroy, for electric railroad cars. The construction of this heater is shown in the accompanying engravings.

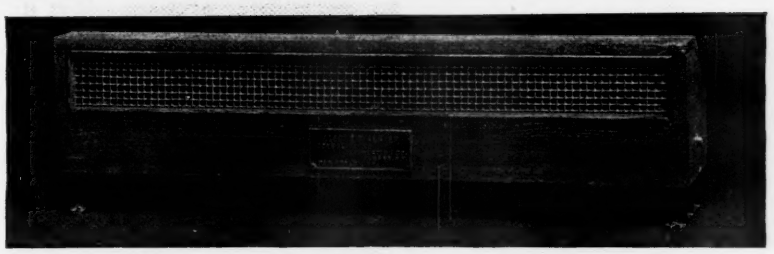
The heat is generated by the passage of an electric current through a resisting conductor. The amount of heat given out equals the square of the quantity of current, measured in amperes, multiplied by the resistance of the conductor in which the heat is generated. The amount of heat given out by an electric heater placed between two conductors, in which a given difference of potential is maintained, therefore depends upon the resistance within the heater itself, and is, moreover, for a given difference of potential, strictly proportional to the amount of current used.

The resisting conductor is divided into parts assembled in different combinations, offering different resistances to the passage of the current, so as to obtain different intensities of heat. The resisting conductor on each car is divided into 12 equal parts, two being combined into one heater; six heaters are placed in each car, three on each side. The resisting conductor wire is coiled in a close continuous spiral. A cylindrical glazed porcelain insulator is provided mounted upon a ⅝-in. square iron rod. A spiral groove is formed upon the surface, and extends continuously from one end of the heater to the other. The resisting conductor is placed in the spiral grooves after being drawn out sufficiently to prevent neighboring coils of the spiral from coming in contact with each other. At the end of each division of the heater a glazed porcelain plate is provided in which binding screws are placed, to which the ends of the spiral are connected. The two parts of the resisting conductor in each double heater are separated by a glazed porcelain plate, so that the parts may be connected independently where the plan of wiring so requires. The spiral resisting conductors are placed on the porcelain insulator, which is supported by the iron rod and carried at the ends of the heater upon two cast-iron supports, which secure the heater and cover to the floor of the car.



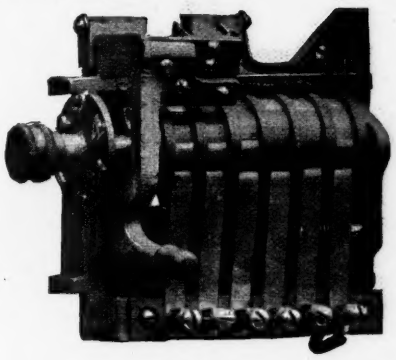
Interior.

HEATER COIL.

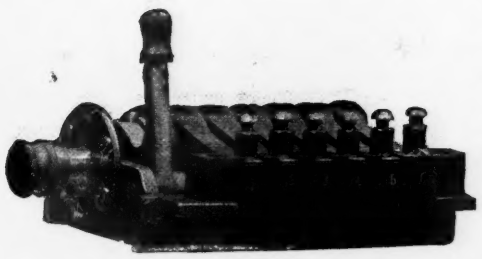


Exterior.

HEATER IN BOX.



Front View.



Side View.

REGULATING SWITCH, WITH CASING REMOVED.

ELECTRIC CAR HEATER.

Made by the CONSOLIDATED CAR HEATING COMPANY, *Albany, N. Y.*

It is claimed that all parts of the apparatus are thoroughly insulated and arranged so that adjacent parts have little difference in potential. Dangers from short-circuiting are, by the construction of the heater, entirely removed. The heater is covered with a wooden box lined throughout with asbestos mill board, in which is made a screened opening through which the circulation of air from the heater is maintained. The resisting conductor is galvanized wire of considerable length, thus avoiding high temperature and any risk of oxidation. Should a failure of the resisting conductor occur, the coiled wire can be quickly replaced, without removing the heater from the car.

The heaters are placed near the feet of the passengers. In cars provided with paneled risers under the seats, the heaters are placed within the risers so that the front of the electric heater with its grated openings takes the place of the panel. No tin or zinc reflectors are needed, as the electric heater throws the heat outward into the car. A free circulation of warm air is maintained, the air flowing in at the bottom of the heater comes in contact with the heated wire spirals and with the porcelain insulators, and then flows up through the casing and out at the grated opening at the front of the heater.

The electric heater is clean, the heating surfaces are not at a temperature at which air can be scorched, and there are no products of combustion to vitiate the air of the car.

The amount of current consumed depends upon the amount of heat desired, the current used being strictly proportional to the amount of heat generated. The least amount of heat on an ordinary 500-volt circuit is obtained from a two-ampere current, while the maximum amount of heat is that of about 12 amperes of current. Five different intensities of heat can be obtained from the five positions of the regulating switch. Sufficient heat is obtained in freezing weather by placing the switch in its third position, at which six amperes of current are used. In zero weather it is necessary to use about 12 amperes of current.

The cost of heating depends on the quantity of current consumed. As this varies with the variable electromotive force carried on most street car lines, the actual electric energy consumed is not readily determined. If the number of ampere-hours on a 500-volt circuit can be once determined, and the cost of an ampere-hour on the same circuit is known, the cost of running the electric heater can be easily ascertained. On most street car lines the total cost of an ampere-hour on a 500-volt circuit is about one-half of a cent. This includes all costs of current, including fuel and water bills, oil and waste, services of employés, repairs to machinery, etc. Charging only the additional expenditure required to generate the additional current needed, the expense will not exceed one-quarter of a cent an ampere-hour on a 500-volt circuit. In weather when three amperes of current give sufficient heat for a car, the additional expenses will be about three-quarters of a cent a car for each hour, and so on for other quantities of current. In other words it costs from one-half cent to three cents an hour to heat a car. The temperature regulating switch has six different positions. In one position the current is open (no heat) and the remaining five positions give different intensities or grades of heat.

In the first position all the heaters are placed in series so that the current from the trolley must pass through their combined resistance. In the second position one-third of the total resistance is thrown out, the remaining two-thirds being placed in series. This results in an increase of about one-half in the intensity of heat. In the third position the switch recombines the electric heaters in a multiple series of two, thereby still further increasing the flow of current and obtaining a corresponding increase in the intensity of heat. In the fourth position the total heating surface is again recombined so that one-third of the electric heaters are thrown out and the remaining two-thirds are combined in a multiple series of two. In the fifth position the remaining one-third is thrown in, making a multiple series of three.

This switch is shown in the accompanying illustration. It consists of a cylinder of insulating material which carries in fixed position on its circumference pieces of conducting metal. Proper connections of the metal contacts are made through the substance of the insulating material itself. The wires connecting the heaters in the several combinations necessary to obtain the different intensities of heat are connected to binding posts in the switch and terminate in multiple spring contacts resting upon the surface of the cylinder carrying the contacts. To prevent sparking across the face of the cylinder in moving the switch from one position to another one combination is broken before the next is made

Dimensions and Weight, Electric Heater.

Length	30⅝ in.
Height	8⅞ "
Depth	6⅝ "
Wire (spirally coiled) in each heater	625 ft.
Wire in set of six heaters, a car equipment	2,550 "
Weight of each heater	23½ lbs.
Weight of regulating box and switch	8½ "
Weight of car equipment complete	149½ "

The World's Fair.

THE TRAFFIC DEPARTMENT.

Few, outside of those actually engaged in the Traffic Department of the World's Fair, can comprehend the magnitude of the work to be done by this department during the next four or five weeks. Last week over 900 car loads of exhibits arrived at the Park, an average of 150 cars a day; they were distributed during that time among the various departments, unloaded and the empties returned. This number becomes small when compared with what Mr. W. H. Holcomb, Superintendent of Transportation, expects to handle if the receipts are as large as expected during April.

Including yardmen and switch-tenders, about 100 men are employed by this department. Their work begins in the evening when the trains arrive from South Chicago and by morning the several hundred loaded cars have been distributed ready for unloading and the empty ones from the day before have been returned to the railroads. The greatest number of carloads received for any one day has approximated 200, but with its present force the department is capable of handling 500 cars a day, and judging from the increase in last week's receipts this number will be exceeded by April 1. If put to its utmost capacity the department can handle, with an increased force, 1,000 cars a day. An agreement has been entered into with the railroads by which switching engines and crews will be furnished as the arrival of exhibits increases, so there will be no delay on account of lack of help. The track accommodations in the grounds will store 1,000 cars and give room for handling 1,000 cars more, without interfering with unloading and disposing of empties.

The amount the railroads have received in freight charges to date has not been made public, but it is, undoubtedly, a large sum, as not less than 32,000 cars of building material have been handled by the transportation department in the past two years, besides the several thousand cars of exhibits that have arrived, the major part of which have come long distances, and the charges have been proportionately heavy. The railroads running into Chicago lend every assistance to this department in rushing goods marked "World's Fair." Most of the goods come in bulk as loaded at starting points, in which case, of course, the cars are delivered to the Belt railroad, and thence to the Baltimore & Ohio or the Illinois Central without delay.

Shipments loaded in general cars carded to Chicago receive prompt attention, and are loaded as quickly as possible into cars destined to the Exposition grounds.

Last Monday a train of flat cars was received by the American Express Company, the first through train of the kind ever run on express time. The shipment consisted of British art works, which were too large to be carried in ordinary box cars.

All the ground in the transportation arena has been fully covered, and exhibitors may rest assured that their shipments will be handled in a manner that for quick service is, in itself, an exhibition of modern transportation methods.

THE MARINE EXHIBIT.

The entire northeast gallery of the Transportation building will be filled with an interesting exhibit showing, by models of the larger vessels and by full size representatives of the smaller ones, the progress made in shipbuilding during the last century.

One of the most instructive exhibits in this division will be that of ship models sent by the great ship builders of England. There will be a great collection of these models, illustrating the progress of naval architecture from the time when iron ships were first set afloat. These models will also reproduce in miniature the fast steamers plying between Europe and America. The display of models of war vessels will not be confined to those of England's navy, but will include those of other navies that are largely built in English shipyards. The greatest of these models will be that of the Victoria, a war vessel built in the year of the Queen's jubilee. It is said to be the most complete model ever constructed, being 30 ft. long, and shows the fitting in minute detail.

All of the space in the marine division given to Spain will be filled by the Spanish transatlantic line with models of the "Invincible Armada" and vessels that were shown in the naval exhibition in Barcelona.

The French transatlantic line will show eleven dio

ramas or realistic pictures of their vessels entering New York harbor, with the Statue of Liberty and the Brooklyn Bridge, and showing the docks at Havre, with the company's special train to Paris. The International Navigation Company is building a full-sized section of the interior of one of its new steamers. It will be decorated and furnished exactly like the steamers in service.

The Hoboken Ferry Company will show a model of the boat built by John Stevens with the original propeller screw.

A model, about three feet long, of the Sultan's barge has been received; the oarsmen are represented by dolls, dressed in sailor costume, each pulling an oar.

Individual manufacturing firms will make exhibits on the main floor of steam, naphtha and electric launches. These boats will range from 15-ft. to 40-ft. cabin launches. Some of these are already in place.

The marine division will show models of inventions by John Ericsson and others, and several foreign countries will send patent models and a few will furnish maps of their marine interests both on the coast and in the interior. The state of New York is to furnish a grand map showing the canal system of the state and another tracing the water route down from Duluth to New York.

The Ingersoll Slab Milling Machine.

The accompanying illustration represents a slab milling machine recently put on the market by the Ingersoll Milling Machine Co., of Rockford, Ill.

The following is a specification of a 36 in. by 36 in. by 8 ft. slab milling machine.

Table.—Thirty inches wide, 8 ft. between the pockets and very heavy. Adjusted by power in either direction, at the rate of 30 ft. per minute.

Feed Motion.—Spiral geared, variable, by means of friction disc, from 5 in. per minute, highest cutter speed, to $\frac{5}{16}$ in. per minute slowest cutter speed. Automatically stopped at any point. Easily adjusted by hand.

Spindle.—Five and one-quarter inches in diameter minimum length of bearing 25 in. Back gearing 24 to 1 with eight changes of speed. Horizontal adjustment of 14 in., vertical adjustment of 36 in.

Arbor.—Three inches in diameter, with out-board bearing 10 in. long, furnished with machine.

Swing.—Cutters to 15 in. in diameter and 36 in. long can be swung on this machine.

Housings.—Doubled webbed, 8-in. face.

Cross-Rail.—Elevated by power or hand. Graduated to read in thousandths.

Driving Cone.—Four stepped for four-inch double belt.

Countershafts.—Two countershafts furnished with each machine. Speed of each, 280 revolutions per minute.

Pump.—Pump and water tank furnished with each machine.

Weight.—About 22,000 lbs.

This machine will mill a piece 36 in. square under a cutter 6 in. in diameter. It is designed especially for railroad and locomotive shops, for milling such work as driving boxes, truck boxes, cross-heads, shoes, wedges, boxes, connecting rods, etc. This machine has been thoroughly tested on this class of work by the makers, who can give the time taken to mill a large number of any of the pieces specified above, with the cost of cutters and the expense of keeping them in repair.

These machines are made in various sizes from 15 in. square to mill 4 ft. long to 36 in. square to mill 8 ft. long.

The makers have milled a cast-iron slab 36 in. wide, cutting $\frac{3}{16}$ in. deep, with a lineal feed of 3 in. per minute, removing by this operation 1,200 cub. in. of cast iron per hour. In other words, the mill has made one cut across the cast-iron slab 36 in. square, taking off $\frac{3}{16}$ in. of the metal in 12 minutes. The type of milling cutter used has been previously illustrated in the *Railroad Gazette.**

The milling cutters are made by inserting teeth of round or rectangular steel rods into the parts, one or more of which may be collected to make cutter. The paths of the cutters overlap so as to give a smooth surface.

Electric Railroads.†

The characteristic feature of an electric motor is that it delivers us the mechanical power we require directly in the form of a couple about an axis instead of in the form of a rectilinear force, as is the case with steam, gas or air engines, which must be reduced to a rotary form by connecting-rod and crank. Thus it is possible to sweep away all intermediate gear, and to arrive at once at the simplest of all forms of a traction motor, consisting of but one pair of wheels fixed on a single axle with the armature constructed directly upon it, with its magnets suspended from it and maintained in their position against the magnetic forces acting upon them by their weight. A locomotive of such simplicity as this has never been constructed for practical work; but on the South London electric underground line the armatures of the motors are placed directly on the axles, and the magnets suspended partly from the axles and partly from the frame.

The cost of working the South London electric underground railroad was as follows, the monthly train-mileage being 36,000 and the number of passengers 553,000:

	Cents per train mile.
Generator station working and repairs:	
Wages	2.24
Fuel	4.84
Water and gas	.56
Oil and stoves	.82
Repairs	.72
Total	9.18
This is equivalent to 3.12c. per B. O. T. unit.	
Cost of locomotive working and repairs:	
Generating station as above	9.18
Wages	3.96
Oil and stoves	.20
Repairs	.46
Total electric power	13.80

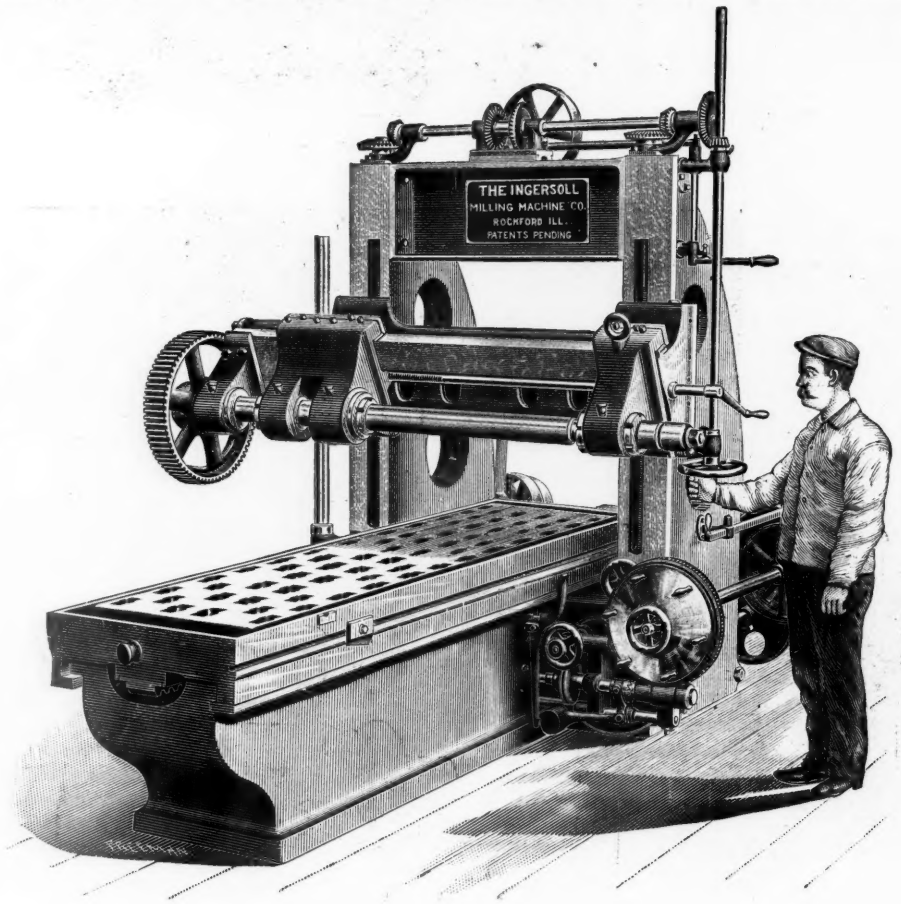
A new model exhibited was a reproduction of the locomotives on the South London line, but with a different arrangement of motors. In the model both armatures are included in the same magnetic circuit, and both magnets and armatures are carried on the frame of the locomotive and not on the axles. They are geared to the axles by diagonal connecting rods, the axle boxes being inclined, so that their rise and fall in the horn blocks is at right angles to the connecting rods. This design allows of the motor armature being placed on the floor level of the locomotive, and is more easily accessible. The model shows the characteristic features as well as the characteristic defects of an electric motor as such. In a series-wound motor the couple or turning moment on the axle is a function of the current only, and independent of the speed and electromotive force. It follows from Ohm's law that the current passing through the motor, multiplied by the resistance of the magnet and armature coils, is equal to the difference between the electromotive force at the terminals of the motor and the electromotive force which would be generated by the motor if it were working at the same speed as a generator of electricity; *i. e.*, the difference between the electromotive force at the terminals and what is called the "back" or "counter" electromotive force of the motor. Hence, if the terminals of the motor be coupled direct to the line at the moment of starting, when the motor is still at rest the current will be very great and its power entirely absorbed in the coils of the armature and magnets; but the turning moment will then be a maximum. The motor then begins to move, part of the power being spent in overcoming frictional resistances and part in accelerating the train. A back electromotive force is then set up, increasing as the speed increases, and causing the current to diminish, until finally a position of equilibrium is established, when the speed is such that the back electromotive force together with the loss of potential in the coils of the motor is equal to the potential of the line. In practice, however, the mechanical strength of the motor and the carrying power of its coils, as well as the limited current available from the generators, make it necessary to introduce resistances in circuit with the motor, to throttle the current and to reduce it within proper limits. In traction work, when starting the motor, resistances must be introduced, which, with the resistance of the motor itself at the moment of starting, absorb the whole power of the current, reducing the efficiency of the motor to *nil*, and continue to absorb a large percentage of the power until equilibrium is established.

This great defect in electric motors for traction work is shown clearly on the South London line. There the motors when working with their normal current have an efficiency of 90 per cent.; but the actual all-round efficiency of the locomotives as a whole is 70 per cent. only, so that the loss in starting is equal to 20 per cent. of the whole power. As a start is made every two or three minutes, various devices have been suggested with a view to diminishing this waste of power in starting an electric motor, but none entirely meet the case. Thus if the locomotive or car has two motors, these can be coupled in series at the start and subsequently thrown into parallel, thereby doubling the tractive force with a given current, or for the same tractive force reducing the loss of power by three-fourths. When through the increase of speed of the motor the back electromotive force balances the electromotive force of the line, the speed can be increased by diminishing the magnetic field by reducing the effective coils on the magnets; but this device does not give any assistance at the lower speeds, as the magnets ought to be so wound as to be high on the characteristic curve, or nearly saturated with the normal current, and it is therefore not possible to obtain any increased intensity of field by increasing the convolution of the magnet coils. If it were possible to use alternate current motors for traction work, the difficulty could at once be met by introducing a transformer in the circuit, and placing the motor in its secondary. The effective convolutions of the secondary circuit could then be varied as the speed increases, in such wise that the electromotive force of the line is balanced by the back electromotive force of the motor and the fall of potential due to the resistance of the motor coils, avoiding all need for resistances.

The South London line has enabled experiments to be made on the loss of power in the generators on the lines and in the motors, the efficiency of the railway system as a whole, taking into account and in the resistances of the locomotives. The loss in the line is about 11 per cent. of the power generated, and the efficiency of the locomotives as a whole is 70 per cent.; thus the electrical efficiency of the entire system is 62 per cent. The trains weigh with full load of 100 passengers about 90,000 lbs., and the average speed between stations is 13.5 miles per hour. On the Mersey railroad, where the grades and traffic were similar, the locomotives weigh, 150,000 lbs. and the train, seating 350 passengers, 336,000 lbs. The cost of locomotive power is 28 cents per train-mile, double that of the South London electric line, but for a train weighing five times as much and carrying 3½ times the number of passengers. Thus the cost of steam traction per ton-mile of train is about half that of electric traction. The real basis of comparison is, however, the cost per passenger-mile; and here electric traction has a great advantage, as the dead weight of the motor is small in comparison with that of a steam locomotive of equal power, and with electric motors the trains can be made smaller and run at more frequent intervals at but slightly increased cost. The proper function of electric lines is therefore not for trunk lines, but for the elevated or underground lines in great cities where a frequent service is essential. It is also adapted for branch lines where water power is available.

As regards the suggestion that speeds of 200 miles per hour would be obtained on electric railroads, the power required to propel an ordinary train 200 ft. long at 200 miles per hour, against the resistance of the air alone, apart from the frictional resistance, would not be less than 1,700 H. P. Though there is nothing to prevent the construction of electric locomotives capable of developing this or even greater power, the strength of the materials at present at command will set a limit to the speeds which may be obtained.

In order that the engineer may realize the imperfection of all his works, it is well for him to be constrained from time to time to contemplate the amount of energy involved in his final purposes, compared with the energy of the coal with which he starts. Starting with the familiar 12,000,000 ft.-lbs., the energy of a pound of coal there is a loss in each step, supposing it made with the most economical appliances known to the engineer; fira



FEED SI E.

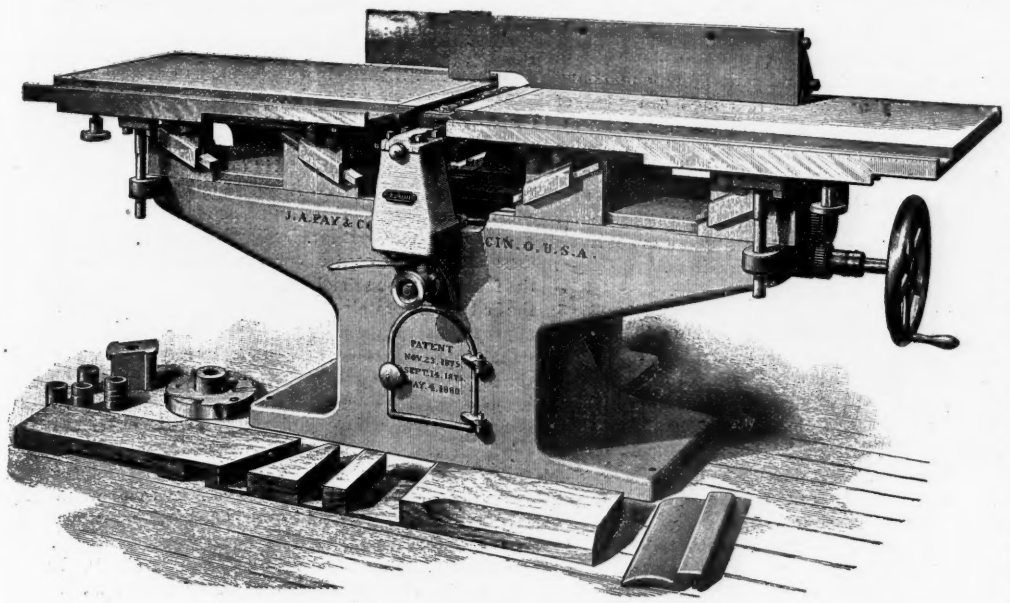
SLAB MILLING MACHINE.

Made by the INGERSOLL MILLING MACHINE COMPANY, *Rockford, Ill.*

* See page 766 of the issue of the *Railroad Gazette* for Oct. 14, 1892.

† Paper read by Dr. Edward Hopkinson, M. A., before the Royal Institution (England), Feb. 24, 1893.

in the boiler, then in the steam engine, generator, dynamo-conductors, locomotives, in the dead weight of the train, till finally we arrive at the energy expended on the passenger himself, which we find to be 133,000 ft. lbs, or but little more than one per cent. of the energy with which we started. Transportation is a more economical process than lighting with incandescent lamps, in which the final efficiency is about ½ per cent., but whether in lighting or in traction, 99 parts are now wasted for 1 part saved, and we may realize that the future has greater possibilities than anything accomplished in the past.



No. 4 Large Variety Wood-Worker.

Made by J. A. FAY & CO., *Cincinnati, Ohio.*

No. 4 Large Patent Variety Wood-Worker.

This newly-designed machine has been suggested by the demand for a large and heavy machine, capable of doing many different kinds of work on large timbers and wide material. It is framed similar to the No. 2 Variety Wood-Worker, but on a more massive scale to meet the requirements of car and locomotive builders, not only on heavy work, but in any light use it may be put to, to a degree of perfection not hitherto reached. It will plane out of wind, surface straight or tapering, rabbet, joint, bevel, gain, chamfer, plow, make glue joints, square up, etc., raise panels either square, bevel or ogee, stick beads, work circular molding, rip, crosscut, tenon, rout, bore, etc. It is furnished with one 16-in. four-side steel-slotted planing head, rabbeting and jointing heads and 3½-in. capped molding head, and, when desired, it can be equipped with expansion grooving or paneling heads and a boring and routing table, having vertical and lateral adjustments to suit the size of material to be worked.

The tables are made of iron, each 27½ in. × 48 in., are planed true, and have independent vertical and lateral adjustments by means of the hand-wheel at the working end of the machine. When facing and planing out of wind, the vertical and lateral adjustments can be made simultaneously, thus constantly retaining the proper distance between the periphery of cut and edge of table.

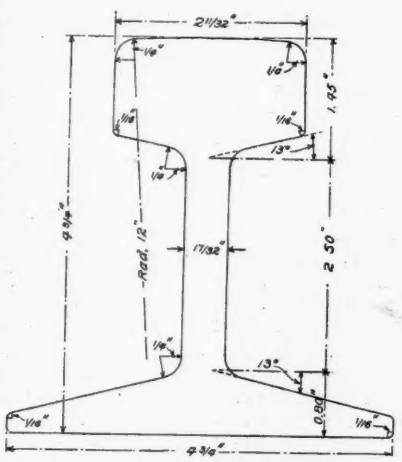
All the different functions of the machine are secured by the use of two tables, thereby effecting a saving of time in making the adjustments. The tables are made with grooves to receive the gaining frame, and are made continuous by filling pieces connected with them when so used. For sawing, a short supplemental table is inserted between the other two, making a continuous saw table.

The arbor is of steel, 1¼ in. in diameter, and revolves in three bearings supported on the column. The bearing on the front side of the machine is planed in a seat, the height of which to the centre of the arbor is equal to one-half the diameter of the largest head to be used. It is readily detachable for the purpose of substituting different heads. This is very important, as it gives greater stability to the arbor, and obviates its liability to spring. The bearings on the back of the machine are planed and gibbed in a seat, and have a lateral movement with the spindle and cutter-head for accuracy of adjustment in gaining, rabbeting, etc. This movement is accomplished by means of a small hand wheel on the front side of the machine.

The fence requires no separate adjustment. Being attached to and forming a part of the forward table, it always maintains its proper position in relation to the knives. It is adjustable across the table, is fitted to receive pressure springs for holding down the material, and swings to different angles for beveling work.

A safety guard is supplied with the machine for covering such portion of the planing head as may not be used in working narrow material.

A shop number is placed on each machine, and numbers on each casting, for reference in ordering supplies. When the countersbaft is placed at a distance of 7 ft. from the machine, a belt 17 ft. 8 in. long, 8 in. wide, is required to drive the cutting spindle. For further information address the makers and designers, J. A. Fay & Co., Cincinnati, O.



70-lb. Rail and 40-in. Splice—St. Louis & Eastern Railway.

The Proposed East River Bridges.

Under Chapter 101 of the laws of 1892 of the State of New York, a corporation known as the East River Bridge Company is authorized to build two bridges between New York City and Brooklyn—Bridge No. 1 commencing at a point at or near Broadway, Brooklyn, between the present pier line and Marcy avenue, crossing the river as directly as possible to a point between Delancey and Rivington streets on the New York side; Bridge No. 2 commencing between the pier line of the East River and Fulton street, Brooklyn, crossing to a point between Jackson and Scammel streets in New York City. Plans for these two bridges were completed some time last autumn, and on Oct. 29 a public hearing was given before the Board of United States Engineers in the War Department Building in New York City. At this meeting it appeared that the only objection to the plans as they stood came from parties representing the towing interests, on the ground that, although the plans provided for as much clear headway under the centres of these two bridges as now exists under the present East River Bridge, viz., 135 ft., still vessels able to pass under the present bridge, where the channel is practically under the highest point of the bridge, could not pass with equal facility under the proposed bridges, where the channel is not under the centre but near the Brooklyn shore, owing to the strong tendency of vessels in tow to keep in the channel. The approval of the Secretary of War was delayed in order that a thorough consideration of this point might be made, and was finally given on condition that the central height of Bridge No. 1 (the more northern of the two) should be 140 ft.

The final step in the preliminary work was completed last week, when a franchise was granted by the New York Board of Aldermen and signed by the Mayor. Mr. Geo. B. Cornell, Chief Engineer of the company, states that actual work on Bridge No. 1 will begin as soon as possible, that all legal complications that could delay a beginning are out of the way, and only a few condemnation suits remain to be settled.

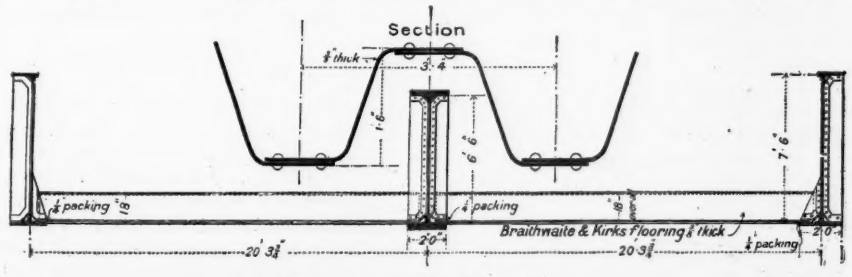
Contracts for the construction of the bridge and approaches have not yet been let, but some are expected to be made before May. What the exact cost of the enterprise will finally amount to it is difficult to estimate; but it is thought that, in round numbers, the cost will be $25,000,000. The cost of constructing each bridge alone is calculated at $9,000,000.

It is thought that at least six years will be required to build Bridge No. 1. Bridge No. 2 will not be begun before Bridge No. 1 is at least half completed, and it may not be begun until the first bridge is fully completed, as the company is under no obligation to complete both bridges at the same time.

It is intended that an elevated railroad shall run from Desbrosses Street Ferry on the North River across New York City, in two branches, one to and across each of these bridges to Brooklyn, crossing all present elevated roads 14 ft. above grade, with stations at each for the transfer of passengers. The cost of a single fare from Desbrosses Street Ferry, which will include the bridge, will be five cents. It is also intended to run local trains from Brooklyn to New York over Bridge No. 1, and from New York to Brooklyn over Bridge No. 2, without change of cars, and vice-versa, the fare to be same as that of the present East River Bridge.

Steel Bridge Floors Without Transverse Girders.

The use of trough floors for bridges is gradually extending to larger spans or widths, and at the same time making transverse girders unnecessary, and increasing the headway of bridges. The engraving herewith illustrates a steel flooring of greatly increased depth, made by Messrs. Braithwaite & Kirk, West Bromwich, and lately used by Mr. Copperthwaite, M. I. C. E., on the southern section of the Northeastern Railway, for a bridge of 64-ft. span, having three main girders 69 ft. long, with the steel floor 18 in. by ⅝ in. by 19 ft. 7⅛ in. long between, riveted to the lower flange plates. The flooring was supplied by the manufacturers and patentees, Messrs. Braithwaite & Kirk, West Bromwich, to the Cleveland Bridge & Engineering Company, the makers of the girders.—*The Engineer.*



Braithwaite & Kirk's Bridge Floors.

Rail and Splice for the St. Louis & Eastern.

We show sections of a 70-lb. rail and 40-in. splice, recently adopted as standard by the St. Louis & Eastern Railway. They were designed by Mr. William E. Guy, President of that company. The distribution of the metal in the section of the rail is: Head, 43.2 per cent.; web, 20.6; flange, 36.2. The rail weighs 70 lbs. per yard, and all of the dimensions are shown on the engraving. The splice is 40 in. long, to be used for suspended joints. The angle bars are slotted on the shoulder ties, but not for the centre tie. The bolt holes are spaced uniformly 6 in. apart except that the end holes are 5 in. from the end of the angle bar. The bolt holes in the outside bar are round, seven-eighths of an inch in diameter, and those of the inside bar oval, seven-eighths of an inch by one and three-sixteenths. A three-quarter inch bolt is used and a Verona nut lock. The other dimensions of the angle bar are shown on the engraving.

Mr. Guy's experience as an engineer and rolling mill man led him to aim to get as much vertical strength of rail and joint as consistent with other parts, also, to make a rail which would caliper with an ordinary foot rule, if possible, and have no irregular fractions, and that could be rolled well. All the measurements which can be calipered are in the multiples of one thirty-second, and the depths of head, web and flange are in 0.5 of an inch. The rail was rolled by the Illinois Steel Co. and is section No. 7,006 of that company.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The recently established Traveling Engineers' Association promises to fill a useful duty, as the subjects to be discussed at their meetings, "Economical Use of Oil and Supplies," "Examination of Firemen for Promotion," "Testing Coal," "Double Crewing," etc., are all points of considerable pecuniary interest to railroads. A careful fireman and a well-trained engineer will not only save a large percentage in fuel, oil and repairs, but will keep better time, haul a heavier load and get a larger mileage out of their engine than an indifferent or poorly instructed crew. It is, therefore, gratifying to see that the traveling engineers, on whose shoulders rests the task of instructing the novice how to fire and manage his engine to the best advantage, should meet together and discuss the best methods of imparting their knowledge in a systematic manner. The best results can only be obtained by discussing, ventilating and sifting the various methods used by different men and on different roads to attain the same object.

The establishment of a joint agency at the New York Produce Exchange by the Trunk lines which carry grain from Lake Erie ports to New York is an important move, as it indicates that the several roads are agreed on the policy to be pursued in conducting this grain traffic. They have appointed a committee to revise the rates as often as necessary, and an endeavor will be made to apportion the tonnage about in the proportions that the roads have secured it in the past three years. The Pennsylvania is probably not an important party to the agreement as the grain which it gets at Erie goes to Philadelphia (or Baltimore), but that grain has its influence on New York shipments, of course. Boats on the Erie canal can take wheat to New York for three cents a bushel or less, but the spectacle of a considerable movement by rail at less than that figure last year seems to have impressed upon the roads the fact that they were probably pulling down rates considerably by competition between themselves. The rate agreed upon by the roads to open with, this season, is six cents on wheat, but whether the boatmen will advance their rates near enough to this to give the roads such a share as they think they ought to have remains to be seen. The confidence that this will be done must, of course, be one of the main planks in the railroads' policy, for if the boats bid actively they will accept a good deal less than six cents. The fact that under what may be called normal conditions the number of boats bidding for grain at Buffalo is somewhat limited is evidently relied upon to aid in maintaining the rate. It is to be remembered, of course, that when other freight is plenty the roads may not want this grain except at a rate far above what the boats are willing to carry it for; and, on the other hand, that the longer time occupied by the boats in transit is sometimes an advantage to shippers. This traffic affords a good opportunity for testing an agreement of this kind. The rates are subject to no requirements as to publicity and can therefore be changed at will. The traffic managers of all the roads are close together and changes can be quickly made, with the minimum of friction. No announcement is made as to whether freight will be diverted (in case of inequalities) or differential rates made to induce it to divert itself. It is to be hoped that the latter course will be pursued. The recent action of the Chicago eastbound roads in diverting, or attempting to divert, large shipments, instead of carrying out their announced plan of making differentials was not a successful experiment. There is doubtless plenty of freight at Chicago which can be diverted without trouble, but the practice is, for obvious reasons, objectionable, nevertheless. A road which refuses freight when it has engines standing idle is sure to make some enemies, and it is not likely to make friends—even for its competitors.

When a railroad's earnings fall off to any serious extent we generally hear very soon of a reduction of force in the shops and a sudden slackening of improvements, if any are in progress, together with other scrimping measures. But there are conspicious exceptions to this general rule and the contrast is significant. For example, the Pennsylvania Railroad's report of earnings for February, lately published, shows that since Jan. 1, the net earnings of the Pennsylvania system (east and west of Pittsburgh) have fallen off a million and a half dollars as compared with the same two months of 1892. The severe weather west of the Alleghenies not only interrupted freight traffic there, but interrupted it so long that the volume of shipments through to the seaboard shrunk greatly, and this, with the effects of the snow in Pennsylvania and other eastern states, and other causes resulted in a diminution of gross earnings east of Pittsburgh of $176,554 for the two months. The loss west of Pittsburgh was even greater, but on both parts of the system the expenses increased more than the income decreased, so that the change in net is such as would cause consternation in the office of a road managed from the Wall Street end. But we do not hear of any discharge of men from the Pennsylvania's shops, or reduction of wages or shortening of working hours. On the other hand we hear of additions to office forces and other expenditures which are usually made only when business is brisk. Evidently the fact that new engines and cars will be needed next autumn and that old cars and engines needing repairs can best be prepared for service then by putting them through the shop now, when traffic conditions and wages rates are most favorable, does not seem to be shut out of sight, on the Pennsylvania, by a fluctuation like this in the current cash account. The explanation of this course of action is found in the fact that this fluctuation, great as it is, in one sense, nevertheless is not large enough to warrant postponing necessary work on engines and cars. But saving in wages is an "economy" that can be made to show itself immediately, while the losses due to putting cars in the shop, in summer or fall, when they might, if ready, be used to get paying freight, are intangible and of such a character that they can possibly be "explained" out of existence; and so the pay-roll-paring style of economy is likely to continue in favor on many roads a good while longer. A railroad which borrows money at five per cent. to keep its shops running in February, and thereby enlarges its available supply of passenger cars in the excursion season or of freight cars in the grain-carrying season, obviously makes money by the process if it then gets decently profitable traffic to fill the cars (as has been generally the case for several years), but men with the courage to borrow in that way are conspicuous by their absence on many roads. The importance of keeping employés supplied with regular work should be a strong argument in support of the policy pursued by the Pennsylvania, especially when the visits of grievance committees are becoming more and more frequent; but if real economy is aimed at in the shops the financial importance to the company of retaining workmen who are known to be trustworthy and efficient ought to be a sufficient incentive, without regard to sentimental reasons.

Modern Rails.

In 1890 Mr. P. H. Dudley brought out a system of rail sections of original and somewhat novel design. These were shown in full sized sections in the *Railroad Gazette* of Aug. 15, 1890. The system comprises five series of three rails each, varying by 5 lbs. from 50 lbs. per yard up to 105. The characteristics are broad, thin heads, heavy bases and somewhat thick webs, the web increasing in thickness toward the base. The heads vary in width from 2¼ in. for the 50-lb. section up to 3½ in. for the 105-lb. section. This width is the extreme over the lower corners of the head. Mr. Dudley gives the side of the head an inclination of $\frac{1}{16}$ to 1, uses a ½-in. upper corner radius and a 12-in. crown radius for the two lighter series and 14-in. for the three heavier series. The distribution of the metal in the various weights varies somewhat, but taking three different sections we find the percentages of metal in the various parts:

	55 lbs.	65 lbs.	100 lbs.
Head	37.6	39.8	40.5
Web	24.6	22.9	25.1
Flange	37.8	37.3	34.4

These figures are liable to some correction but they are accurate enough to illustrate the point, which is that the distribution conforms pretty closely to the sections designed by J. D. Hawks, R. W. Hunt, F. A. Delano and various others of the new school. We do not mean to intimate that Mr. Dudley has followed any of these men; on the contrary we are not sure but he is the founder of the school. At any rate he was one of the first to deliberately, and consciously, and for reason, apply to steel rails the principle of so distributing the metal that all parts of the section will cool at about the same rate, so far as may be. His own claim is that his 80-lb rail, designed in 1883 for the New York Central & Hudson River Railroad, was "the pioneer of the broad and shallow heads and thick bases for heavy rails." From that rail the series of which we speak was evolved. The aim was to get a rail that would cool uniformly and could be rolled colder, that would be stiff and that would permit the use of hard and tough steel. Other advantages were sought in the new sections, but for these the reader is referred to the paper mentioned above.

Probably the greatest advantage was to be found in the uniform cooling of the whole section and in the thorough working of the thin head. This advantage is shared by all of the modern thin-headed sections, but Mr. Dudley thinks that his own section, with the web thickened toward the base, and the flange itself, thicker and somewhat narrower than in most recent designs, secures the result of uniformity and freedom from internal strains better than any other design. However this may be, one result of the introduction of this type of section has been to permit the use of higher carbon than folks dared to use in the old, large-head section. For instance, the 75-lb. rail of the Dudley section rolled for the Adirondack & St. Lawrence Railroad ran from .54 to .64 carbon. It was nominally a .60 carbon rail. The 95-lb. rail designed for the Boston & Albany was also a 60-lb. carbon rail, within narrow limits. The tests of these rails during the rolling showed not only a stiff section but very tough material. Some account of tests made at Bethlehem will be found in the *Railroad Gazette* of Nov. 6, 1891. The Boston & Albany rail was made with .60 carbon and phosphorus not to exceed .06, with restrictions as to the other metalloids. Of course the stock was selected. At first some heats were rejected, but by careful attention the product soon came out very uniform in quality and tough. It is an interesting fact to mention here that by the use of the magnetic separator much of the phosphorus is taken out of the ore before it goes into the blast furnace.

In the Bethlehem tests of these high carbon rails the elastic limits were found to run from 55,000 to 60,000 lbs. per square inch. The elongation per inch of the metal, under the drop test, was from 6 to 8 per cent. under the greatest tension either in the head or base, and up to the breaking point it was from 8 to 16 per cent. Rails turned on their sides under a drop falling 20 ft. on the edge of the base showed an elongation of 17 to 18 per cent. in the lower edge of the base without breaking. To plane these rails for frogs and switches requires tools of self hardened steel, and the chips cut out are very tough, not brittle. Interesting particulars of these rails are given in the article just referred to, but while the results of tests at the mills were very satisfactory, these particular high carbon rails had yet to undergo extensive trials in the track during the hard winter.

Up to the end of 1892 the Boston & Albany had in the track about 17,000 tons of the 95-lb. rail, of which over 10,000 tons were put in in 1891. The Adirondack & St. Lawrence put in, in 1891 and 1892, about 26,000 tons. The Buffalo, Rochester & Pittsburgh put in over 8,600 tons of an 80-lb. rail. The New York Central & Hudson River put in 18,000 tons of the 80-lb. rail in 1892 and 3,585 tons of the 65-lb. rail besides 3,000 tons of 100-lbs. rails; and the Rome, Watertown & Ogdensburg put in 12,000 tons of 70-lb. in 1891. The Central Vermont put in 2,700 tons of 75-lb. rails in 1892. We believe it is true that, notwithstanding the exceptional severity of the last winter, not one of these rails has been broken in the track. If this is so, the question of the safety of high carbon rails, manufactured under proper supervision and rolled into correct sections, will be placed beyond doubt.

The superior wearing qualities of the small-headed rail, even when not high in carbon, have now been demonstrated on more than one railroad. The 80-lb. New York Central rail was adopted in 1883 and put in service in 1884. It has been laid on some 500 miles of track. This early 80-lb. rail was not made under such close restrictions as to chemical composition as those of which we have just spoken. The carbon ran from .25 to .70, but the wear has been excellent all the way through. It would be interesting to have comparative results of the wear of the high carbon and low carbon rails of this section under exactly similar conditions; but while we cannot get such figures there are results available which show the wearing qualities of the section. At the Mott Haven junction the early 80-lb. rail of .28 to .30 carbon was put in, and it is there subject to a very heavy traffic. Besides the through trains there are many suburban trains passing, and there is much switching in and out of the car yards and roundhouse, making an unusual amount of engine movement. The rails here are subject to the passage of about a million tons a month. In eight years the loss at this place has been from ¼ to 5-16 of an inch from the head of the rail. Out on the line on tangents the loss is not more than half of this.

While the advantage to be gained from the uniform cooling and colder rolling of the rail is perhaps the principal one, or at any rate is the one that has been chiefly contended for in the discussions of the subject, this type of section has other and very important advantages, one of which is the superior stiffness for a given weight of metal, gained by the more uniform distribution of the metal between the head and flange. While we would say nothing to retard the progress toward the use of heavier sections, it is sound engineering to save all the metal you can in rails as well as anywhere else, if you get as good results. It is obvious that if one can get an 80-lb. rail of one section that will be as stiff as an 85-lb. rail of another, he will, other things being equal, choose the lighter rail of the stiffer section. Perhaps it would be good ultimate economy for him to buy an 85-lb. rail of the stiff section; but that is another question, to be decided by entirely another set of conditions.

There is still another phase of the new type which has been very well presented by various writers and which was brought with singular force by Mr. D. J. Whittemore in his paper before the American Society of Civil Engineers a few years ago; that is, the importance of distributing the great wheel weights now common over as large a surface as possible. Actual tests have shown static pressures of from 80,000 to 150,000 lbs. exerted by engine wheels on the area of contact between the wheel and rail. Of course the dynamic pressure is much greater. The wear of rails and wheels under such a force is inevitably very great, but there is probably no question that it can be reduced by distributing the weight over a broader headed rail. It is found, for example, that the wide head of the 80-lb. rail on the New York Central gives the same average mileage of locomotive tires for $\frac{1}{16}$ of an inch wear of tire under loads of 18,000 lbs. on the driver as was formerly secured with the 65-lb. rail and loads of 13,400 lbs. on the driver. The mileage for one turning has run up from 100,000 miles to 130,000, 150,000 and even to 167,700 miles, and there is one case recorded of a mileage of 187,000 on this road. Of course we do not venture to attribute these gains in life of tires entirely to the form of the rail head; but it is probable that the broader rail has much to do with the greater life of the tire.

In what we have said we must not be understood as advocating Mr. Dudley's section in preference to the design of Mr. Hawks or Mr. Hunt or Mr. Delano or anybody else. Perhaps, indeed, the standard sections that the able committee of the American Society of Civil Engineers will by and by reveal to the world will give the best sections that mortal man has yet designed, and will gradually consign to obscurity the efforts of individual designers. Not having seen the results of the committee's labors we cannot pretend to say how revolutionary they will be, but we believe that they are in the line of the type of rail section of which we have been talking and we believe that this type is destined to revolutionize practice in rolling rails all over the world. In the United States it has already produced a great effect, but on the continent of Europe it seems to have made little or no impression yet, and in England the bull-head section will doubtless be retained until somebody invents a rail section of far greater merit than anything that has yet been contrived; but that the modern American practice as embodied in the sections designed by the gentlemen whom we have named above will prevail in those countries where the flange, or Vignolles, rail is used there is, we believe, little doubt.

The "Rocket" at Rainhill.

While nothing is more difficult than to determine who is the original and true inventor, our statement to which "Locomotion" takes exception in the letter on the first page of this issue, is the generally accepted account of the state of the "Rocket" at the Rainhill trials. The "Rocket" was altered subsequently to 1830, and as she now stands in the South Kensington Patent Museum undoubtedly differs in many respects from the "Rocket" of 1829. The weight of evidence, however, is in favor of her having had (1) a blast pipe, (2) a multitublar boiler and (3) a rectangular, stayed firebox, three essential features of every modern locomotive, and generally regarded as being combined for the first time in the "Rocket" of 1829. Zerah Colburn, an able and unprejudiced writer, who investigated the matter carefully and whose testimony carries more weight than family traditions, says in his history of the locomotive engine: "After every deduction it remains to the credit of George Stephenson that he was the first to combine the blast pipe and modern locomotive boiler in a high speed passenger engine."* As regards the blast pipe Zerah Colburn writes of the "Rocket": "The exhaust steam from each cylinder was carried through a pipe of considerable length and turned upward into the chimney. The two exhaust orifices were not, however, contracted so as to produce a strong blast. . . . After the trials the two exhaust orifices of the 'Rocket' were thrown into one and so contracted th at the exhaust steam produced a powerful blast in the chimney." Mr. William Gowland, who drove the "Rocket" at the Rainhill trials, made a declaration in 1848 stating that George Stephenson in his hearing asked Mr. Timothy Hackworth how it was that the "Sanspareil" made such an abundance of steam, and Hackworth described the contraction and position of his blast pipe, the orifice of which was about 1¼ in. dia. This was shortly after the official trial of the "Rocket," but her exhaust pipes were immediately afterwards thrown into a single pipe with a contracted nozzle."

Sketches of Stephenson's original double nozzle in the chimney and Hackworth's improved single nozzle as used by him on the "Royal George" in the same year, 1827, were sent by Mr. J. W. Hackworth to the *Engineer* (London) and were published in that journal Aug. 14, 1857.† This would tend to show that Stephenson first used the double nozzle blast pipe and was indebted to Hackworth for the improvement of a single nozzle. As regards "Locomotion's" assertion that the "Rocket" had a draft created by bellows, Zerah Colburn states that this method was employed on the "Liverpool," an engine built by Edward Bury, of Liverpool, which commenced working July 22, 1830, and that "this arrangement had been previously employed by Stephenson in one or two engines constructed shortly before the "Rocket."

"Locomotion" also asserts that the "Rocket" had not a multitubular boiler at the Rainhill trials. Zerah Colburn, however, gives the dimensions and number of the tubes, and states that the railroad directors divided the prize of £500 between Mr. Robert Stephenson, as the maker of the engine, and Mr. Booth as the supposed inventor of the multitubular boiler. . . . The multitubular boiler was suggested by Mr. Booth, the Secretary of the Liverpool & Manchester Railway Company, who was doubtless unaware of what had already been done by Neville and Seguin.‡ That Timothy Hackworth did not at that time appreciate the value of a multitubular boiler is shown by the fact that on March 3, 1830, he laid before Messrs. Stephenson a new plan for a passenger locomotive, in which a single flue and water tubes were used.§ The "Sanspareil," Hackworth's engine at Rainhill, had two large flues, and a total heating surface of only 90 sq. ft., against 138 sq. ft. for the "Rocket." The other competing engine, the "Novelty," by John Ericcson, had one flue 36 ft. long, tapering from 4 in. to 3 in. dia., giving a total heating surface of only 42½ sq. ft. It is very plain from this that the "Rocket" had the only multitubular boiler at the Rainhill trials. The drawing of the "Rocket" in 1829 as given by Zerah Colburn‖ shows the rectangular stayed firebox very clearly, and he states: "The boiler was a cylindrical vessel 6 ft. long and 3 ft. 4 in. dia. traversed by 25 copper tubes 3 in. dia, and through which the gaseous products of combustion were conveyed from a firebox at one end to a tall chimney only 12 in. dia. at the other. The fire grate was 3 ft. wide and 2 ft. in length in the direction of the boiler and the firebox 3 ft. deep and surrounded by a 3 in. water space presented 20 sq. ft. of heating surface. The water round the firebox communicated with that in the cylindrical boiler through two external pipes."

Mr. Nicholas Wood was one of the judges at the Rainhill trials, with Mr. Rastrick and Mr. Kennedy. He wrote a "Practical Treatise on Railroads," which was published in 1825, and later editions of which were published in 1831 and 1838. In this work Mr. Wood shows drawings of the "Rocket," with a square firebox, tubular boiler, and exhaust pipes leading from the cylinders to the chimney. He says that there were 25 tubes, three inches in diameter, and that "the principle of generating steam by this engine is the exhausting power of the chimney, which is aided by the impulse of the steam from the cylinders."

* See page 33 of "Locomotive Engineering," by Zerah Colburn, published 1871.

† A reproduction of this sketch will be found on page 21 of "Locomotive Engineering," by Zerah Colburn.

‡ These patents are dated March 14, 1823; and Feb. 22, 1828, respectively. Seguin applied the multitubular boiler early in 1829 on a line in France, but it is doubtful whether he used exhaust or live steam to create a draft.

§ See page 31, Zerah Colburn's "Locomotive Engineering."

‖ See page 25 "Locomotive Engineering," by Zerah Colburn.

The Taxpayers and Good Roads.

We have received a pamphlet entitled "A Memorial to Congress on the Subject of a Road Department at Washington, D. C., and a Comprehensive Exhibit of Roads, their Construction and Maintenance, at the World's Columbian Exposition," with a request that we will "give expression editorially to our commendation of the *objects sought to be attained.*" If by these objects it is intended to mean *good roads*, we say by all reasonable means let us attain to them, but we do not believe in the means proposed by this pamphlet for their attainment. Fortunately, the proposed expenditure of $100,000 by government for the "comprehensive road exhibit" was refused by Congress. We had previously expressed our disapproval of the measure, and it does not now require to be debated. The prayer of the memorialists for $10,000 to be expended by the Agricultural Department was granted, in the language of the appropriation:

> "To enable the Secretary of Agriculture to make inquiries in regard to the systems of road management throughout the United States, to make investigations in regard to the best method of road making, to prepare publications on this subject suitable for distribution, and to enable him to assist the agricultural colleges and experimental stations in disseminating information on this subject."

And since this sum has got to be spent, we suggest that it can in no way be so profitably employed as by helping some of the colleges to build examples of good roads where they will be useful. Cornell has already undertaken to do this, as a means of instruction to its pupils and to the neighborhood, without assistance from government, but some of the colleges in the prairie states, where the model roads would be of the greatest value, could probably make a very judicious use of the appropriation.

The proposal that the Agricultural Department shall now make investigation in regard to the best method of road making can only proceed from gross ignorance of what is already known upon this subject, which has occupied the attention of engineers for more than 4,000 years, and is the theme of an enormous number of books and essays; and that the Department shall prepare publications on this subject suitable for distribution is like a suggestion that it shall issue a spelling-book or a catechism. The market is full of good books on building roads; the engineering schools teach the art; there are thousands of men who know how to build roads now; the only reason why they are not building such roads at the present moment is because no one will spend the money necessary to build them. Why, then, should the United States Government spend money in teaching more people how to build them? Suppose the originator of this pamphlet wanted to build a mile or ten miles of good road in the most difficult or desolate place in the United States, would he need to set on foot a government inquiry as to the best method of building such a road, and get an appropriation from Congress to publish information as to "the systems of road management throughout the United States," before he would venture upon the undertaking? Of course not; he would step around the corner to the office of an engineer and say "I want a piece of road built; please draw up specifications and take bids for its early completion." If the said originator had the money with which to pay for his road, he could have it of such excellence as he might desire as easily as he could get a suit of clothes. Now, what is true of this supposed piece of road is true of any other; the only thing requisite is money.

How shall money be got? By whom shall it be expended? Those are the vital questions, and they are not questions upon which the United States should

be asked to issue tracts. Let those who have a scheme for any particular road advocate it where it will do the most good, and get taxes voted by those who ought to pay them, and thus get a good road built, if they can, in the place about which they are interested. "It would be something, it would be much, and their lives and labor not in vain," as Goethe remarked.

But this great "national movement" for agitating good roads into existence by means of Congressional documents or shabby Agricultural Department publications seems to be based on the opposite theory. It is not started by the people who need good roads for the purposes of traffic, and who must bear the burden of the cost of building them, but by the bicyclers, horse breeders, coachmen and the lovers of pleasure, who would be pleased to find better roads in a wider extent of country and hope by this agitation to get them constructed. We oppose such a use of the funds which government raises for other purposes. Let those who wish to agitate do so, in Heaven's name, to their heart's content, but not at the cost of the taxpayers of the United States.

Delays of Freight in Yards.

A recent anonymous article on "Delays to Freight in Yards" details the causes for such delay at great length and with great accuracy. The article is evidently written by some one who has had opportunity to observe many cases of such delay, although he probably has not himself had oversight of a large freight yard. He makes, however, what is probably a correct diagnosis of the case in bringing out very forcibly the condition of a railroad whose other facilities enable it to bring freight trains to the terminal faster than the yard can receive them. Under such conditions there is unavoidable delay in the yard; and the fact that such delay is unavoidable—and is admitted by all hands to be unavoidable—has a bad effect upon the men who do the work in the yard, inasmuch as they get the impression that delay is *always* unavoidable, and cannot by any means be obviated.

The remedies suggested by the writer include a better method of yard supervision, coupled with the suggestion that the yardmaster should "be given ample authority to order one or more extra sets of inspectors, repairers and chalkers and provide himself with a sufficient number of yard engines and switchmen to expeditiously handle any threatened accumulation of traffic instead of allowing it to block his yard and the main tracks leading to it for hours and perhaps days."

There is no doubt that the condition of affairs described exists far too frequently on many railroads. The results detailed in the article in question are certain to arise. The crews and engines are held out on the road, and blockades may easily follow. But it is not so easy to see how the proposed cure, which would be very costly, would meet the difficulty. The work in a yard is limited much more by the actual shifting of the cars than it is by their inspection and repairing. To provide additional inspectors and repairers would not get any more trains into the yard if they are kept out by engines shifting cars. In many crowded yards, matters will not be much helped by putting on additional shifting engines. It is not at all unusual to find so many shifting engines in a yard that they get in each other's way, even at times when trains are being held out of the yard on the main tracks.

The yard spoken of in the article referred to has "three or more tracks upon which to receive incoming trains, and ten or more distributing tracks upon which the cars for certain destinations or connecting lines are to be placed," and the largest number of freight trains to be received at one time "varies from seven to ten." Now, unless there are 10 tracks upon which to receive incoming trains, it is absolutely certain that one or more of these freight trains will be delayed, no matter how many inspectors, repairers, chalkers, yard engines and switchmen the yardmaster has at his disposal. Even if the receiving tracks were absolutely clear of cars when the first of these 10 trains arrived, it is practically impossible, even with an unlimited force, to get the cars of the first trains inspected, marked, repaired (if need be) and pulled down to the distributing tracks before the last train arrives. Certainly if, in order to provide room for the last train, some of the first ones have not only to be marked and inspected, but also to be shifted, delay is absolutely unavoidable.

There is only one way, therefore, to prevent these 10 freight trains from blocking the main track, and that is to provide 10 tracks to receive them; and the neglect to furnish the yard with a sufficient number of receiving tracks to provide for an emergency is the cause of the worst delays to freight in yards.

The writer of the article attributes some delay to the fact that inspectors and repairers are not as a rule "responsible to the department having charge of the movement of traffic;" but delays from this cause on roads which are so unfortunate as to have their inspecting force entirely independent of the division organization, are as nothing compared to the delay caused by defective arrangement of the tracks in yards. This is especially the case in yards which have an insufficient number of receiving tracks or, perhaps, no receiving tracks at all. Perhaps the number of these bad yards is greater on railroads whose engineering department is entirely independent from the transportation department. On such lines the men in the yard usually have no voice as to where the tracks are to go, and the engineers quite likely have no idea how they are to be used.

Unless yards are laid so as to facilitate quick work, the best efforts on the part of the yardmaster and yardmen can only mitigate the evil. Although a great deal can doubtless be done in improving the methods of yard supervision, no improvement in supervision will make up for improper arrangement or deficient number of tracks.

The Strikers' Case at Toledo.

The question as to the legal punishment of the Lake Shore & Michigan Southern enginemen who quit work rather than move freight which had come from the Toledo, Ann Arbor & North Michigan road was heard in the United States Court at Toledo on Monday of this week, but Judge Ricks reserved his decision. The injunction case against Mr. Sargent, leader of the firemen, who was ordered to revoke such rules of his brotherhood as required boycotting, has been dismissed, on account of the fact that he resides in another district. This plea did not avail in Mr. Arthur's case, however, as it happens that his residence is in the same judicial district as Toledo, and the similar case against him was heard on Wednesday. It will, therefore, be several days before we shall have decisions, even from the lower court.

Meanwhile, it will be well to condense the various questions involved in this controversy into a form that can be easily grasped, for the air of bewilderment assumed by some of the legal gentlemen who have spoken on the subject, and the discussion, in some quarters, of impracticable schemes of reform, have partially covered up the two main issues, which are (1), Can the Courts punish by imprisonment an engineman or other railroad employé who resigns to avoid obeying an obnoxious law, and (2), Will the extinction by the Court of a brotherhood's rules, which require members to engage in illegal discrimination against a railroad, amount to anything as a practical remedy for such discrimination? These questions have been discussed with great force by some of the daily papers, but in no case that we have seen has more than a fragment of the question been taken up in any one editorial. It is desirable to summarize the conclusions thus far reached, and the present aspect of the matter.

The original controversy between the Ann Arbor road and its enginemen has been virtually settled by the road's success in getting new men. Of the details of the contest very little has been given out, but so far as can be judged by what has been given, the moral of the case is no different from that of several others that have been discussed in these columns; to wit: that reasonable candor and fairness on the part of the superintendent, and a policy which shall keep the employer and employés in touch with each other, is the most effective preventive of strikes and one which seldom fails with sober men of ordinary intelligence. But, as we have said, this strike is settled. The interest in the injunction cases hinges on the general principles involved in them.

The Ann Arbor road procured an injunction against its connecting lines and their officers and employés. Under section 10 of the Interstate Commerce law this applies to an engineman as much as to a superintendent. The superintendent of the Lake Shore had the injunction posted where the enginemen could see it. On the trial, for contempt, of the enginemen who resigned, it was strenuously urged that the defendants had not had sufficient and legal notice of the injunction. It is claimed that the mere fact that they had read the injunction and understood its meaning was not a sufficient notice to make them punishable for contempt in disregarding it. From the facts thus far reported this may be a detail which will have important influence on Judge Ricks' decision. But even if the notice be held to have been sufficient the question simply reverts to the main issue, which is as to the right of an employé to suddenly quit work at a time when his absence will interfere with the reasonable movement of freight. The defendants probably did not disobey the injunction, but they took a mean way to avoid obedience. They are like the boy who does not deny that he deserves a thrashing, but who skulks around the wood pile with such agility that the father's whip does not quite reach him.

This right to quit will be vigorously contested to the last inch. The persistency of the defendants in refusing to tell why they left their jobs, and the tenor of the public utterances of labor leaders indicate this. To the wise railroad officer, however, the practical question is not how to force a man to continue work when he wishes to leave, but rather how to forestall that wish. Judge Ricks may decide that an engineman shall be punished unless he gives a month's notice of intention to resign, and the Supreme Court may sustain him, but no one can keep free men at work by the force of bayonets, or even of policeman's clubs. Whatever the courts may decide, therefore, the main problem remains the same as it is now, how to induce voluntary loyalty of the employé to the employer.

But if the present agitation leads to any profitable discussion, it is more likely to be in connection with the second question, the extent to which brotherhoods may systematize their methods of warfare and employ powerful machinery to carry them out. This question, like the other, is not so much a matter of the just construction of a law as of how to execute it. The discussions thus far have borne pretty hard upon the leaders, but the testimony before the court will probably bring out the fact that the constitutions of the brotherhoods are well devised to relieve individuals of responsibility; so the question at once settles down to the practical one, as old as human society—Are the culprits so numerous that the jails will not hold them? Mr. Arthur evidently has a veto power of some kind, but even with this he becomes a law-breaker only by pursuing a policy of inaction, and that is a kind of offense which it is exceedingly hard to reach by process of law. Then, again, the courts are in the long run subject to public opinion, and the ultimate question is whether the community will approve the enforcement of *unwritten* boycott rules. In the long run, intelligent people who use railroads and who suffer by high prices or by scarcity of food or fuel when trainmen strike, must succeed in compelling the regular operation of railroads, even if they have to string a line of policemen along every mile of track; but at present so large a share of the people fail to realize their dependence upon the railroads that the majority generally favor strikers as "the under dog in the fight." The fact that the force of public opinion is thus slow to operate is what makes a resort to the law a precarious remedy for the present difficulty. The power of the state being thus hampered by limitations, the key to the situation is in the hands of the railroad companies, as we have intimated.

Wonder has been expressed that the power of the courts has not been invoked, long before this, to compel trainmen to treat the public fairly in a case like that now engaging attention at Toledo; but there is no occasion for wonder, for public sentiment is too favorable to the theory that every oppressed person may rightfully attack the real or supposed oppressor nearest him, regardless of secondary injuries caused by the attack. A court punishing a railroad employé for trying to get the better of the corporation is too likely to be overruled by legislatures and constitutional conventions. It is certainly to be hoped that every engineman or other employé, high or low, who accepts cars from one road and refuses them from another will be punished, for the law forbidding such discrimination is a just one; but we have hitherto had to be content with discharging him, and it will be exceedingly difficult to provide any severer punishment than this.

We have spoken of punishment by imprisonment as a vital issue in this matter. It is true that many enginemen have more or less accumulated wealth, and that the infliction of fines might be of some avail in enforcing respect for law; but it is fair to assume as a general proposition that in the absence of an enforceable contract the ultimate remedy against "laborers," whether they get $1 or $20 a day, must be corporal punishment.

As a means of inducing employés to reflect more deliberately before deciding to strike we have mentioned the feasibility of a contract based on a deposit of money by each individual (and, of course, reciprocal obligation on the part of the railroad). In doing this we have not forgotten that the perfect manager ought to be able to keep employés contented without any contract. Neither do we discredit the recent remark of a railroad president that he was willing to make a contract (without bonds) with one brotherhood (the engineers) because that one could be depended upon to carry out its agreement. But perfect managers are somewhat scarce, and the exigencies of railroad management often neutralize for many months, or even for years, the best efforts of the wisest manager. Changes of ownership, promotions, deaths and other contingencies introduce obstacles that are hard, if not impossible, to overcome. As for the honor of the engineers, that is a most encouraging fact and one which deserves to be scrupulously recognized; but in considering the construction of a general rule for dealing with railroad employés we must be guided very much as in other affairs of life; we must assume that the only binding contract is one bound by a material thing and not by honor alone. For these reasons a money consideration is neither unbusinesslike nor unreasonable. Railroad officers who talk about the good to be derived by getting employés to become stockholders in the road have here an excellent opportunity to apply their theories, and there are various inviting ways of modifying them. If the stock of a road has a stable value the mere promise of shares at the end of a term of years, on condition of not striking, would be a powerful influence for harmony.

The peculiarities of freight car seals are so numerous that their variety is past finding out. One manufacturer of a patent seal claims to know some dozens of different ways in which the common lead-and-wire seal can be broken and the breakage afterwards repaired or cancelled so as to deceive a sharp inspector. But an important point to remember in this matter is that in the great majority of cases the "sharp inspector" need not be looked out for; a very ordinary in

spector—in fact a careless one—is generally the only enemy that a pilferer need to reckon with. That this is realized is shown by the following communication that we have received from a claim agent of a Western road. He says:

The latest device of dishonest trainmen which has come to my notice is a very slick one, well calculated to throw suspicion upon innocent parties. The dishonest person secures a supply of leads and wires, and entrance to the "sanctum" of the agent at some station where he has an opportunity of handling the seal press. He puts the wire through one hole of the lead and inserts in the other hole a wire nail a little larger than the wire used with the seal. The press is used on this combination, the wire nail withdrawn, and he has then a device which needs only to be put on in the ordinary way, the loose end of the wire run through the prepared hole and bent back, to present to the seal recorder or casual observer an apparently complete seal. The plan works extremely well where the car happens to have been opened to remove freight at the station whose number the "seal" carries, and if it wasn't opened there, throws a doubt on the correctness of the seal taker's record. This is an excellent device for "beating" the record.

The Australian mail brings some particulars of the floods in Queensland. Brisbane, the capital of Queensland, is situated on a winding river a few miles from the Pacific. A phenomenal local rainfall caused the river to rise 80 ft. at Ipswich, a few miles higher up the valley, while four miles above Ipswich the river showed no rise whatever. The rainfall in Brisbane was 42.19 in. in nine days, while 50 miles further north, near the coast, 67.52 in. fell in three days, over 29 in. falling on one day. At other points 80 in. and 73.36 in., respectively fell in eight days. The aboriginals, whose traditions extend back for centuries, have no knowledge of so high a flood. Two large iron bridges were swept away at Brisbane. The railroad bridge was double track 3 ft. 6 in. gauge in seven 80-ft. deck spans and one 160-ft. through span founded on cast iron cylinders filled with concrete. It stood 43 ft. above ordinary high water, and the iron work weighed 1,427 tons, and it was moreover weighted with loaded trains to give it stability. The velocity of the current was roughly estimated at 17 miles per hour. The actual rise at Brisbane is given as 23 ft. 9 in. above mean H. W. S. T., which flooded a very large portion of the town and stranded a gunboat in the Botanical Gardens.

A statement has been circulated that the high speeds on the Philadelphia & Reading had a serious effect on the permanent way, and in one instance three miles of heavy rails had been so bent that they had to be removed from the track. The bends were stated to be in waves about 18 ft. in length, and the cause was alleged to be the effect of running engines with the ordinary size of driving wheels at an excessive speed where the effects of the counterweights became most disastrous to the permanent way. This statement, however, appears to be utterly without foundation. The responsible officers of the road not only know of no instance where rails have been bent in the track by locomotives solely on account of high speed, but have also found no perceptible increase in the wear of rails accompany the high speeds at which the New York and Washington trains are now run.

NEW PUBLICATIONS.

A Report on Shapes for Structural Iron. Vienna: The Austrian Engineers' and Architects' Society. Eschenbachgasse, No. 9. Price, 5 marks. 1892.

The above report, which has just been issued, is, in reality, a new and much enlarged edition of a report on standard structural iron shapes, first brought out in 1882 and prepared by a special committee, appointed at that time by the Austrian Engineers' and Architects' Society to examine into and report upon the subject. This original edition was exhausted several years ago, and it was accordingly concluded to supplement it by a new one, which should give, in addition to the matter previously published, suggestions as to desirable additions to and changes in already existing iron shapes.

The extent and usefulness of the work done by the committee can be properly appreciated only by an actual examination of the published report which, though naturally restricted in the matter of text, embraces 17 elaborate tables for facilitating calculations in connection with all the various shapes in current and prospective use, and which are shown in full size on 33 lithographic plates. The text is confined to a brief exposition of the principles on which the different shapes are based. The plates show the different I, U Z, and T irons, and the various angle irons used in ordinary building construction as well as in marine architecture, car building, etc. Special standard shapes employed in ship, car and locomotive building also are shown, together with a comprehensive lot of shapes, more or less ornamental in character, and designed for window framings, ceiling moldings, etc. Aside from its value to constructing engineers and architects as showing the shapes either carried in stock or available at short notice, the report cannot fail to be of much interest to the rolling mills also, as illustrating new and special shapes for which there either already exists, or soon will be, a demand. Both producers and consumers of structural iron, therefore, have reason to feel themselves indebted to the compilers and publishers of this report for much useful and conveniently arranged information. As regards the shape in which the publication has been issued, it is somewhat to be regretted that stiff covers were not used instead of the flimsy paper ones to protect the inclosed matter.

The Tabor Indicator. Bridgeport, Conn.: The Ashcroft Mfg. Co. Price, $1.00.

This is a well written and clearly illustrated treatise describing the Tabor indicator and the manner in which it should be used in ascertaining the operation of the steam in the cylinders of locomotives and other engines. The methods of computing the horse power and the amount of steam used per horse power, as accounted for by the indicator diagram, are clearly explained and several useful tables are given.

An interesting example of the value of the indicator is given in the accompanying diagrams, which are taken from the work under view. Figs. 1 and 2 are diagrams taken from an engine that had received the customary adjustment of the valves in the shop. When taken out on the road, the engineer thought by the sound of the blast that the exhausts were uneven. The valves were reset until a uniform "beat" was obtained. The diagrams show the manner in which the steam was distributed after the change. One diagram was taken when the reverse lever was in the first notch and the other in the third notch. It is evident that the distribution of power was very uneven, and that this could only be detected by the use of the indicator, which consequently was the means of discovering a wasteful use of steam.

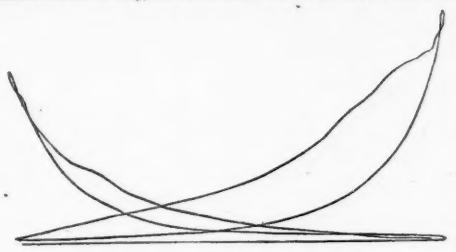


Fig. 1—Valves Set by Sound.

Speed, 208 revolutions; first notch; scale, 80.

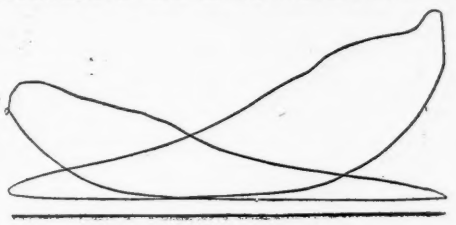


Fig. 2—Valves Set by Sound.

Speed, 210 revolutions; third notch; scale, 80.

Figs. 3 and 4 were taken after the valves had been again adjusted, and show that it was perfectly possible to obtain a good and equal distribution of steam at the two ends of the cylinder.

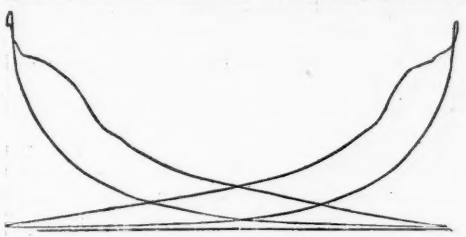


Fig. 3—Correct Adjustment.

Speed, 204 revolutions; first notch; scale, 100.

A stronger argument in favor of the more general use of the indicator could scarcely be found. At the present day, when locomotives are called upon to exert their utmost power and speed, it is obvious that an accurate knowledge of what is going on inside the cylinder is very necessary, for no engine can do its best when working steam as wastefully as shown in figs. 1 and 2, and its effective power would be considerably increased when the valves were properly set so as to give the diagrams shown in figs. 3 and 4.

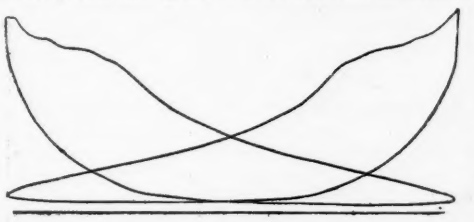


Fig. 4—Correct Adjustment.

Speed, 198 revolutions between second and third notches; scale, 100.

Catalogue of the J. A. Fay Company.—This company has just issued a very handsome illustrated catalogue of 350 pages. The catalogue shows the extensive line of tools and machines made by this company which are well known the world over.

Elevated Electric Railroad at the World's Fair.

The elevated electric railroad is now nearing completion at the World's Fair grounds. One train is now on the tracks, and it is expected that the cars will be running within three weeks. It will then be the second electrically operated elevated railroad in the world, the one just opened in Liverpool, England, being the first. If the line proves as successful as its promotors anticipate the road will undoubtedly be the prototype of many others in the large cities of the country. It is therefore of more importance than a mere method of transporting passengers about the grounds, although that, of course, was the primary consideration leading to its construction in a place where surface roads and the smoke nuisance were tabooed. To all interested in the subject of rapid transit in large cities, the intramural road, as it is called, will undoubtedly be the most interesting feature of the exposition.

The road is being constructed by the Western Dummy Railroad Company, an offshoot of the General Electric Company. The officers are: President, B. E. Sunny; Secretary, E. C. Ward; General Manager, W. E. Baker. The engineering staff consists of C. P. Matlack, Chief Engineer; C. H. Macloskie, Electrical Engineer; B. J. Arnold, Consulting Engineer and Designer of Power Station; R. I. Sloan and G. K. Wheeler, Consulting Engineers.

The line is 3.10 miles long, double tracked, with loop terminals. The stations are located at the Iowa building, Fifty-seventh, Fifty-ninth and Sixty-second street entrances, transportation annex, railway terminal station, the colonnade, forestry building and at the loops, making 10 in all.

The foundations for the structure are generally concrete, 7 by 7 ft. and 1 ft. deep, placed about 4 ft. below the surface of the ground. On the lower portions there are two posts framed into a cross-sill, braced at the bottom and fitted into a cap at the top. The posts are a foot square and 12 ft. between centres, sill of the same size and caps 12 by 15 in. The posts and caps are long leaf heart yellow pine; the sills and foot braces are Norway pine. The spans are generally 25 ft. except in a few places, where they are greater. The grades have been designed as far as possible to allow an ascending grade approaching each station. This utilizes the retarding and accelerating effect in approaching and leaving stations. The heaviest grade is 1½ per cent., and there are several as high as one per cent.

The power house is situated in the southwestern corner of the grounds, south of the forestry building. It is a frame structure, with a back wall of brick through which the flues from the furnaces pass to the smoke-stack. The station and its equipment were designed by B. J. Arnold and were planned for inspection as an exhibit as well as for a working plant.

The boiler room is 140 ft. long by 60 ft. wide and contains ten 300 H. P. Babcock & Wilcox water-tube boilers. In the rear of the boilers are smoke flues of brick, leading to the stack, which is 100 ft. high and 10 ft. in diameter. Two batteries of Greene's fuel economizers are located outside the building. The water flows by gravity from the lake, about 300 ft. from the station, through an 18-in. pipe. The condenser pumps force the water through the condensers and lift it 6 ft., high enough for the water to flow back into the lake through another pipe. The feed water from the hot wells is forced by the feed pumps through fuel economizers and then to the boiler. The hot gases pass through the economizers to the stack, thus heating the feed water to a high temperature before entering the boilers. Oil will be burned as fuel, and a variety of oil burners will be used under the boilers to test the merits of the different apparatus.

The engine-room is 140 ft. by 87 ft. wide, with a corrugated iron roof. Much care was devoted to the engine foundations, owing to the nature of the soil. The earth was excavated to a depth of three feet below the surface below the frost line. Over this is a temporary grillage work, consisting of two layers of 4 x 12-in. plank, placed at right angles to each other and thoroughly spiked together. Upon this mass of timber was built a mass of concrete 140 ft. by 60 ft. and 3 ft. thick, made of Portland cement and sand. Upon this were built the engine and condenser foundations.

The largest engine, placed in the centre of the room, is a 2,000 H. P. Reynolds-Corliss cross compound condensing engine, built by the Allis company, of Milwaukee. It is coupled direct to a 1,550 kilowatt Thomson-Houston multipolar railroad generator. This dynamo is the largest on the World's Fair grounds, and on account of its great size it was shipped from Lynn to Jackson Park in separate parts. The armature will be wound and the generator assembled in the station. This is undoubtedly the largest dynamo-electro machine in the country. The armature shaft alone weighs 65 tons. It is of solid steel 24 in. in diameter. At one end of the building is a 750 H. P. Reynolds cross compound engine coupled direct to a 500 kilowatt Thomson-Houston multipolar generator with an over-hung armature. This generator is so built that the fields can be moved off from over the armature by means of screws and hand wheels, thereby permitting easy access to the armature or fields for repairs. Midway between this engine and the largest engine is located a 750 H. P. Hammond-Williams compound, condensing, vertical engine, coupled direct to a 500 kilowatt Thomson-Houston multipolar generator. This generator is of the same design as the one coupled to the Allis tandem engine, except that it is provided with an out-board bearing for the armature. At the other end of the engine room is located a 750 H. P. tandem cross compound condensing Greene engine, built by the Providence Steam Engine Company, of Providence, R. I., belted direct to a multipolar 500 kilowatt Thomson-Houston generator. Between the Greene engine and the Allis engine is placed a 400 H. P. tandem compound condensing engine, built by the McIntosh & Seymour company, of Albany, N. Y., coupled direct to a multipolar 200 kilowatt Thomson-Houston generator.

The condensers and boiler feed pumps for the entire plant are located in a condenser pit between the engine and boiler rooms. This is left open, with a railing about the top, so that visitors will have a good view of this machinery. Indeed, ample facilities are given for spectators about the entire plant, aisles running entirely around the engine room. There is also a gallery between the engine and boiler rooms. In this condenser pit will be located two Allis vertical flywheel condensers, which are to work in connection with their engines. To the Williams engine there will be attached a flywheel condenser built by the Conover Manufacturing Company, of New York. To the McIntosh & Seymour engine will be attached a single acting condenser, built by the Deane Steam Pump Company, of Holyoke, Mass. The Greene engine will be attached to a duplex condenser manufactured by Henry R. Worthington, of New York. The feed water for the boilers will be supplied by a triplex

pump built by the Gould Manufacturing Company, of New York, and a duplex steam pump built by the Smith-Vaile Company, of Dayton, O. The valves for handling the condensers and engines, furnished by the Chapman company, will be controlled by wheels located near the engines, so that the engineers can start the machinery without changing their positions to any great extent.

The rolling stock will consist of 18 trains, each of four cars, the first car in each train being equipped with four motors. The motors are of a special type, built with the idea of getting up high acceleration in short distances. The motors have nominal horse powers of about 133 each, making a total of 532 to each train. The cars are controlled on the series-parallel principle, the motors being placed in series at the start and gradually thrown into multiple. The cars are equipped with the New York air brake of the latest approved design, and will stop the train at its highest speed in about 400 ft. They are 47 ft. long and each will seat 96 people.

The conductor for carrying current from the power station to the trains consists of a 60-lb. steel T-rail, similar to those used for the tracks, mounted on insulated blocks and placed outside the track. Each rail is connected to each succeeding rail through two copper plates riveted through the splice bar holes, the splice bar being omitted. The current is carried from this rail to the car by means of a sliding copper shoe which rests on the top of the rail and is held in contact with it by a spring. The current is returned through the iron structure, passing from the track to the iron girders through a copper wire, and then from girder to girder through heavy copper plates riveted to the webs. Mr. Macloskie has charge of the electrical engineering.

The road is equipped with the Rowell-Potter Safety Stop Company's block signal system, which, besides having a visual signal, has also an automatic arrangement for throwing on the air brakes in case the engineer runs over a signal.

The cars will be lighted with incandescent lamps. The cars are open. Doors are placed at the side and can be opened by means of one lever from the end of each car, so that when the trains come to the stations all the doors on one side of the train can be opened instantaneously to unload passengers and take others on. As soon as the train is loaded the gates can be closed again by means of the levers in the ends of the cars. The cars and trucks were manufactured by the Jackson & Sharpe company, of Wilmington, Del. The motors and electrical equipment were especially designed for the purpose by the General Electric Company of New York. The wheels and axles were furnished by the Griffin Wheel & Foundry Company, of Chicago.

It is expected that the round trip will be made in 40 minutes, stopping at all stations, at a headway of a little over two minutes. The fare will be 10 cents, and tickets will be deposited in choppers, as on the New York and Chicago "L" roads.—*Western Electrician.*

Cox's Earthwork Computer.

The cut shows a new mechanical device for computing the cubical contents of railroad or other cuttings and embankments. It consists of a graduated dial with an inner revolving graduated disc, the whole mounted on a board 12×14 in., with brass centre swivel and locking nut. The different scales on the dial and disc correspond to the terms of the two formulæ whose solution they give, their circumferential positions being determined by the same.

Earthwork contents are generally computed by one of two methods, viz.:

First—By means of the centre height and the distance out to slope stakes, or

Second—By means of the centre height and the angle of the surface slope with the horizon, the angle of the side slopes being known.

The formula employed with the first method is

$$\text{Contents prism } A\,B\,D = \frac{B\,D \times M\,H \times L}{54} \quad \text{. . Eq. 1.}$$

and with the second method

$$\text{Contents prism } A\,B\,D = B\,D^2 \times L \times K \text{ . . . Eq. 2.}$$

where

$B\,D$ = Centre height, including height of grade prism;

$M\,H$ = Distance out to slope stake from centre height;

L = Length of prism;

K = Coefficient calculated for surface angle $\alpha +$ or $\alpha -$ according to formula $K = \frac{\text{Sin } \beta \times \text{sin } \gamma}{54 \text{ sin } \delta}$

All measurements are in feet except the contents which are in cubic yards.

Either of these equations may be at once solved with the computer, while the surface angle corresponding to any distance out to slope stake, and vice versa, is also seen by inspection with the same setting of the disc.

Example 1. Let

$M\,H = 21$ ft. $\quad B\,D = 29$ ft. $\quad H\,N = 42$ ft.

$A\,M = 12$ ft. $\quad C\,N = 36$ ft.

To obtain the contents of the prism $A\,C\,D\,A$, for the length of 100 ft.: Set slope stake width $M\,N = 63$ ft. on the *outer* scale of the disc; opposite centre height $B\,D = 29$ ft. on the dial; then over length of prism $L = 100$ ft. on the disc, find contents = 3,380 cu. yds. on the dial. The exact quantity by Eq. 1 is 3,383.3 cu. yds.

The contents for any other length from 1 to 100 ft. is at once found with the same setting.

Example 2. Let

$B\,H + H\,D = 20 + 29 = 9$ ft.; angles $\alpha +$ and $\alpha - = 15°$;

side slopes = 1 to 1; roadbed = 18 ft.

To obtain the contents of the prism $A\,C\,D\,A$ for a length of 100 ft: Set centre height $B\,D^2 = 29^2$ ft. on *inner* scale of the disc opposite surface angle $\alpha - = -15°$ on *outer* scale of dial (by means of the radial arm) then over length of prism $L = 100$ ft. on the disc, find contents of prism $A\,B\,D\,A = 1{,}225$ cub. yards on the dial.

Now

$$\frac{\text{set } B\,D^2 = 29^2 \text{ ft.}}{\text{opposite } + 15°} \text{ then } \frac{\text{find } 2{,}125 \text{ cub. yards}}{\text{over } L = 100 \text{ feet.}}$$

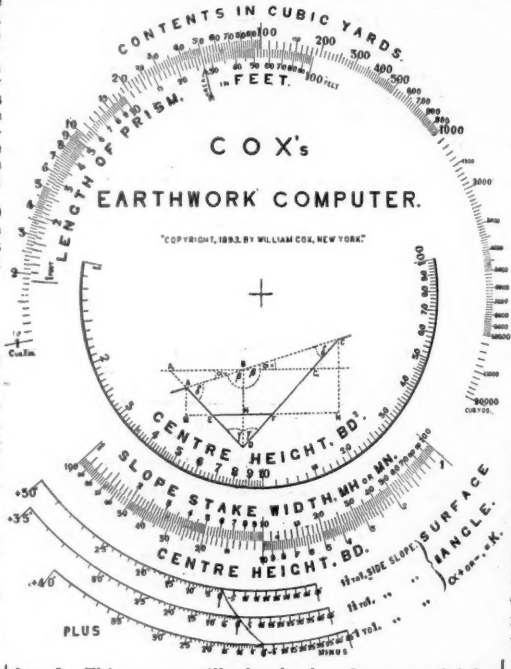
= contents of prism $B\,C\,D\,B$, whence contents of prism $A\,C\,D\,A = 1{,}225 + 2{,}125 = 3{,}350$ cubic yards. The exact quantity by Eq. 2 is 3,356 cubic yards.

From the contents thus obtained, there must in each case be deducted the contents of the grade prism $E\,F\,D$, which can be immediately obtained by means of the computer, or from the following table, which gives the centre height of the grade prism and the contents for 100 ft. length, corresponding to different widths of roadbed and side slopes.

Road bed width.	1 to 1.		1¼ to 1.		1½ to 1.	
	H D	Contents	H D	Contents	H D	Cont's.
12 ft.	6 ft.	133.3	4.8 ft.	106.7	4 0 ft.	88.9
14 "	7 "	181.5	5.6 "	145.2	4.67 "	121.0
16 "	8 "	237.0	6.4 "	189.6	5.33 "	158.0
18 "	9 "	300 0	7.2 "	240.0	6.00 "	200.0
20 "	10 "	370.4	8.0 "	296.3	6.67 "	246.9
22 "	11 "	448.2	8.8 "	358.5	7.33 "	298.7
24 "	12 "	533.3	9.6 "	426.7	8.00 "	355.6

When the grade prism is an odd length, as 45, 75, etc. feet, the contents will be more easily obtained by means of the computer.

There is at the top of the disc, somewhat to the left, an arrow marked *Area*. The reading opposite this arrow is the area of the triangle whose slope stake width and centre height have been set to coincide, or of the triangle whose centre height and surface angle have been brought into coincidence by the radial edge of the arm. By this arrow, therefore, the area of any triangle whose base and perpendicular are known is at on



found. This arrow will also be found very useful for obtaining contents by means of the prismodial formula, thus: Having obtained the mean area

$$= \left(\frac{\text{Area one end + area other end + 4 times middle area}}{6}\right)$$

by means of the computer set the arrow to this amount, when opposite the length will be found the contents.

The following points should be borne in mind:

1. When the data given are centre height and distance out to slope stakes, then the bottom scale on the disc of slope stake widths is used in conjunction with the contiguous scale of centre heights $B\,D$ on the dial.

2. When the data given are centre height and surface angle $\alpha +$ or $\alpha -$, then the inner scale on the disc of centre heights $B\,D^2$ is used with the lower scales on the dial of surface angles (taking due note of the side slopes), the settings being obtained by means of the radial edge of the arm.

This instrument was invented by Mr. William Cox, C. E., New Brighton, N. Y., and is sold by him for $5.

A Test of Viscosimeters.

A test of viscosimeters recently made at Cornell University by G. F. Wagner and K. B. Miller, students in engineering, is of interest to those officers of railroads who are connected with the testing laboratories. It is claimed by some that the lubricating values of oils are inversely proportional to their viscosities. While this is not strictly correct or capable of general application, viscosity is an important factor in determining the relative suitability of oils for different uses; and if accurate methods can be devised for determining the viscosities of different oils at certain temperatures this will be a practical way of finding one of the many important points which determine their relative values as lubricants, which every railroad can easily make use of.

Six viscosimeters were tested, of which one was a Tagliabue, two were pipettes and three were standard orifice viscosimeters. The Tagliabue viscosimeter consists of a reservoir from which a small pipe leads to the discharge orifice several inches below. Surrounding all is a jacket of water which is kept at the desired temperature. The oil is discharged by opening a faucet in the pipe, and the time required to discharge 50 c. c. is the time given in the table. The pipette viscosimeter is used by the Pennsylvania Railroad, the Baltimore & Ohio, and some others in making oil tests, and is probably the one in most general use. It consists of a glass bulb having a tube at the upper end, into which the oil is poured, and one at the lower end which gradually diminishes in diameter to form the orifice. The bulb is surrounded by a water jacket through which the water circulates from the heater. Between two marks on the tube above and below the bulb is contained 100 c. c. of the oil to be tested, and the time required for this amount to discharge through the orifice is taken, and this is the time given in the table. The standard orifice viscosimeter was designed by Prof. R. C. Carpenter, and consisted of a copper vessel about six inches long, tapering slightly from top to bottom. In the centre of the bottom was the discharge orifice, about one-sixteenth of an inch in diameter and closed by a simple valve. The metal around this hole had a sharp edge. The oil was heated to the desired temperature by means of a water jacket, and the temperature measured by a thermometer suspended in the oil. The most accurate method for measuring the flow from the orifice was found to be by means of a float which carried a vertical wire. The wire was marked in two places, and the time was taken as these passed a fixed point; this was the time required to discharge 25 c. c., and is the time given in the table for standard orifice No. 3.

The following table gives the averages of all results and also shows the viscosities of the lard oil and engine oil as compared with water at 68 deg.:

Viscosimeter.	Temperature.	Water. Time C.	Lard oil. Time A.	Lard oil. Viscosity. A ÷ C.	Engine oil. Time B.	Engine oil. Viscosity. B ÷ C.
Tagliabue	68	27.5	165.50	6.02	172.66	6.27
"	100	.....	81.41	2.56	71.83	2.61
"	120	.....	64.92	2.36	56.33	2.05
Pipette No. 1	68	31.5	81.87	2.60	88 42	2.81
" " "	100	.....	54.87	1.74	51.00	1.71
" " "	120	.....	47.87	1.52	47 25	1 50
" " 2	68	33.17	115.62	3.48	85.75	2.58
" " "	100	....	75.87	2.28	60.50	1.82
" " "	120	.....	65.50	1 97	51.00	1.54
Standard orifice No. 1	68	23 67	31.00	1.31	28.50	1.21
" " "	100	....	26.75	1.13	25.12	1.06
" " "	120	....	25.75	1.09	24.25	1.03
Standard orifice No. 2	68	26.17	38.67	1 47	35.00	1.34
" " "	100	.....	30.87	1.18	28 33	1 08
" " "	120	.....	29.12	1.11	27.00	1.03
Standard orifice No. 3	68	6.08	9.25	1.52	8.53	1.37
" " "	100	.....	8.17	1.34	7.25	1.19
" " "	120	.....	7.92	1.30	6.92	1.14

The *Sibley Journal of Engineering*, to which we are indebted for the report of the test, gives a table showing each reading as taken duriug the test, and that table shows even more decidedly than the above table the difficulty of duplicating results obtained with the pipette viscosimeter. This difficulty is due partly to the inaccuracy of the temperature measurement and to the friction in the tube. The last column in the table indicates clearly that the standard orifice viscosimeter gives results that are reasonably accurate, especially when the measuring is done with a float as was done with No. 3. No. 1 was furnished with an ordinary gauge glass but it was found that with heavy oils the surface of the oil in the glass lagged behind the surface of that in the reservoir. With No. 2 the time was taken between two marks on the receiving vessel.

The points in favor of the standard orifice viscosimeter are, that the size and shape of the orifice and of the reservoir can be readily duplicated and are easily kept clean, and the oil in the reservoir can be brought to the determined height. The results obtained with it need not vary more than 5 per cent. if care is used in manipulation.

Railroad Legislation in England.

Apparently the English lawmaker, like his American cousin, still sees a certain vote-getting quality in pitching into the railroads. Some of the bills now before Parliament are indicated in the following extracts from an article in a recent issue of the *Railway News* (London).

For nearly thirty years we have chronicled many vicissitudes in railway history, but at no period has the outlook for the shareholders been so ominous as at present. Not only are the railroads subject to be legislated upon by the Government of the day, but each one of the 670 members of Parliament who has a "railway crochet" may shape it into a railway bill.

The companies have not had time to recover from the strain of the Rates Act, and the Regulation of Railways Act, of the late government, before they are confronted with a formidable list of projected bills. Attention may be directed to three classes of bills that are likely to be persevered in, viz., Hours of Labor, Workmen's Trains and Employers' Liability bills. The first of the three classes is the most serious and onerous. There are two bills, one backed by Mr. Mundella, the other introduced by Mr. Channing. Both bills agree in placing in the hands of the Board of Trade authority to inquire into and revise the hours of labor and intervals of rest of railway servants, but whereas the Government prudently leave in uncertainty the information on which active interference may be founded, Mr. Channing clearly defines the *modus operandi* of setting the Board of Trade machinery in motion. Any two or more persons in the regular employment of the company, or the chairman, secretary, or other official of a railway servants' trade society, or any ten ratepayers in the vicinity of a railway, may lodge a complaint of excessive hours of duty with the Board of Trade, and set on foot an inquiry by a Government inspector.

The Cheap Trains (London) Bill, promoted by Sir J. Blundell Maple, purports to have for its object the re-

moval of some of the difficulties in housing the working classes. The method is as simple as it is presumed to be effective—viz., requiring railway companies having termini in the metropolis, to carry workmen at specially low fares from and to the suburbs. The "zone" system is introduced as the most effective mode of attaining this desirable end. There are to be four zones, the first of 5 miles at a return fare of 2d.; the second, 10 miles, 4d.; the third, 15 miles, 6d.; the fourth, 20 miles, 8d. The great difficulty of the zone system is a delimitation of the zones. . . . To begin with, the scale, if adopted, would raise the fares from many places. . . . This is not, of course, intended, and if the present low fares are to remain the zone system breaks down. Again, the distance from London Bridge to Brockley Lane is 3¾ miles, fare 4d. That would be reduced to 2d.; distance from Ludgate Hill to Nunhead is 5¾ miles, fare 4d. That would remain. Brockley and Nunhead are within half a mile of each other, although the latter is approached by a more circuitous route. What follows? The workmen would desert Nunhead with its fare of 4d. in favor of Brockley with its fare of 2d. Workmen's houses at Nunhead would be depleted, while those at Brockley would be filled. Comment is needless.

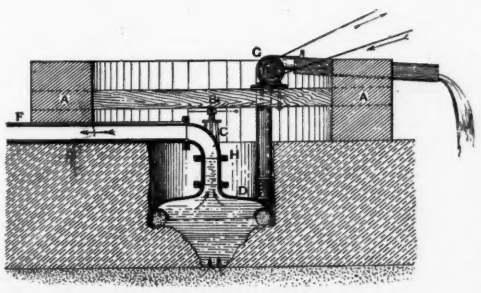
The Employers' Liability Bill provides, with certain reservations, that a workman receiving injuries in the course of his employment shall have the same right to compensation as if he were not a workman, and that his membership of a benefit fund shall be no bar to his claim; in fact, that he may not contract out of the act. This bill is of very general application and affects nearly all employers of labor. What railway men think of it may be judged by a deputation from the North Western company which waited upon Mr. Asquith to urge that they may be allowed to contract out of the Employers' Liability Bill, because they can make better terms with their employers. It is surely an infringement of the liberty of the subject to prohibit them from doing this.

There are several features in common in the bills we have passed under review. They all appeal to the workman, who has many votes. They all display that cheap philanthropy which benefits a second party at the expense of a third, and they all assume the right to squeeze and impoverish the railroad companies from motives which bear a suspiciously political origin. Each one of these bills means a money loss, and coming on the top of the Rates Act they have a special significance. We write in no alarmist spirit, but we cannot view without a feeling akin to dismay the many influences now at work depreciatory of railroad property. That the investing public shares this view is indicated to some extent in the fall of about £4,000,000 in the market value of the ordinary stocks of six of the northern companies during the past two months, and in the letters we continue to receive from indignant shareholders.

An Expedient in Beton Foundations.

In pumping out large foundation excavations in which a preliminary layer of concrete or béton has been put down, water may force its way through the concrete bed at some points and occasion trouble. An expedient adopted in connection with the Amsterdam harbor works is described in a recent issue of the *Industrie Zeitung*.

In building one of the large dock gates, two 6½ in. bore-holes had been driven to determine the character of the underlying strata. Both holes passed through a thick bed of quicksand, then through a thin layer of clay, and finally reached coarse gravel. After the concrete foundation layer had been put in and the water was pumped out of the excavation, it was found that large volumes of water came up through the test holes and worked their way through the concrete bed above, producing in the latter large funnel-shaped holes over six feet in diameter. The uninterrupted work of two centrifugal pumps was necessary to keep the water under control. The first attempts to stop the holes consisted in filling them with fresh supplies of concrete, but as these proved of no avail the following method was followed:



Around each opening in the concrete bed was built a wall, *A A*, confining the ends of two stout beams, *B*. These served as abutments for two jack-screws, *C*, which held down a cast-iron shield, *D*, of about the same diameter as the wash-out, or about 6 ft. The joint between the shield and its concrete seat was made watertight by the use of a packing ring of moss and vegetable fibre. The water which came up from below was carried away through the pipe, *F*. That much having been accomplished, the water above the shield was pumped out by the centrifugal pump *G*, and the hole was filled with concrete in bags and rammed. The water escape pipe was then removed, the opening at *H* was closed with a screw cap, and the whole was covered over with more concrete, bringing the surface up to the level of the concrete bed proper. The result was perfectly satisfactory, except in point of cost, which was rather high, though the expense account had been credited with the cost also of the earlier attempts to close the holes.

Foreign Railroad Notes.

The length of the new railroads opened in the German Empire in 1892 was 500 miles, against 310 in 1891 and 700 in 1890.

When the cholera threatened last summer, the Northern Railroad of France supplied 500 Pasteur filters to 400 stations on its lines where the water is suspicious. The company maintains a special laboratory for bacteriological analysis, and has the water examined there.

On the first day of this year the international freight traffic regulations went into effect on the continent of Europe, to effect which changes have been made in the railroad regulations and even in the laws of several European countries. These regulations have been the subject of international negotiations ever since 1878.

TECHNICAL.

Manufacturing and Business.

The Ohio Falls Car Manufacturing Co. has declared a dividend of 2 per cent. on its preferred stock, payable at the offices of Messrs. Maitland, Phelps & Co., New York, April 1.

The Gordon Railway Signal Co. with a capital stock of $250,000 filed articles of incorporation in Denver last week. The incorporators are Angus C. Gordon, J. D. McMaster and Edward B. Fenner.

The Mable Automatic Car & Air Coupler Co., of Fort Collins, Col., was incorporated last week with $50,000 capital.

The Sheffield Velocipede Co., of Three Rivers, Mich., is just completing an order for 50 cane cars for Cuba to be used on plantations there. These cars are about one-half the size of ordinary platform cars and have many interesting features. The same company is also busier than usual in its velocipede and hand-car department, and, in addition to the usual orders for goods for domestic use, it is working on orders for railroads in the Argentine Republic, Italy and Australia. The business of this company has increased so rapidly during the past few years that constant additions to the plant are necessary. During the present winter the company has added a new stand-pipe shop with the latest improved machinery, the lathes in some cases being operated by electric motors. It has also built an office building and pattern shop, with the capacity increased over the former building four fold.

The Blackmer & Post Pipe Co.'s new works, located on Arsenal street, St. Louis, are now in full operation, having been occupied by the firm for the first time last week. The main building, of brick, is 100 ft. × 250 ft. and four stories high. The machinery consists of two large dry pans and four wet pans for grinding and tempering the clay; two steam pipe presses, one of which is the largest in the country. The power is furnished by a 250-H. P. Corliss engine. The kilns, 14 in number, each 25 ft. in diameter, are located on three sides of the building. The building is lighted throughout by electricity. The new plant adds about 50 per cent. to the former capacity of the works, making the output now about eight car loads of finished product a day.

The Minnesota State Grain Inspection Department has decided to adopt the St. Paul Clay Car Seal Company's seal as the official seal of the department. The initial order placed by this department was for 50,000 seals, and the Terminal Elevator Company, at Minneapolis, who are also adopting the same seal, have ordered nearly 200,000 of them for immediate use.

Henry B. Morse, President of the Edge Moor Bridge Works, and C. B. Houston, agent of the Paxton Rolling Mills, have been appointed by the Court to make an inventory and appraisement of the assets of Cofrode & Saylor, incorporated, of the Philadelphia Bridge Works, which recently passed into the hands of Receivers.

The Robinson-Rea Mfg. Co. has let a contract to the Shiffler Bridge Co., of Pittsburgh, for its new foundry building, which will be a 134 × 200 ft. iron building with corrugated iron sides and roof. It has contracted with William Sellers & Co., of Philadelphia, Pa., for one 60-ton and one 30-ton double traveling crane, 80-ft. span.

The Carborundum Works, of Monongahela City, Pa., which manufactures wheels for grinding purposes, will increase the present capacity of 250 lbs. to 500 lbs. a day. The wheels are used by the Westinghouse Electric Co. for grinding its lamps, and by the National Tube Works, of McKeesport, for sharpening dies without removing them from their positions.

The New York offices of the Westinghouse Air Brake Co. and of the American Brake Co. have been removed from 160 Broadway to Rooms 1206 and 1207 Havemeyer Building, No. 26 Cortlandt street.

All arrangements for the amalgamation of the Harris Car Works, of St. John, N. B., with Rhodes, Curry & Co., of Amherst, N. S., have been completed, and the carworks will be removed to Amherst at once. The new company will have $200,000 capital. The Harris Co. has large orders for cars already on hand.

Iron and Steel.

The Bessemer Steel Works in Pueblo, Col., are running at their fullest capacity and will be busy for months to come.

New Stations and Shops.

The Georgia, Carolina & Northern has selected a site in Abbeville, S. C., for the shops of that road, which, it is reported, will cost $100,000.

Tests of an Allis Pumping Engine.

Prof. R. C. Carpenter, of Sibley College, Cornell University, with several students from that institution as assistants, made a test last week of the triple expansion pumping engine built by E. P. Allis & Company for the North Point pumping station in Milwaukee. This engine showed in the official tests made a year ago 12.15 pounds of water used per horse power per hour, the best record ever made by any engine. This is a vertical engine with cylinders 28, 48 and 74 in. in diameter, and 60 in. stroke. The plungers are 32 in. in diameter. The rated capacity is 18,000,000 gallons and the speed, with 125 pounds steam pressure pumping against a head of 55 pounds, about 20 revolutions per minute. E. P. Allis & Co. are represented in the present test by Mr. J. H. Lewis and the city of Milwaukee by Mr. Thos. McMillan, Chief Engineer.

The Russell Snow Plow.

The reader may remember the description of the Russell snow plow in the *Railroad Gazette* in 1891. We have watched its performance with some interest since that description was published and are now permitted to print the following statement from an officer of the Delaware & Hudson Canal Co.: "A plow of this pattern which we have upon roads north of Albany has been used during the past winter with good results, staying on the track and cutting through the snow much better than the old style plows which we have in use elsewhere upon our lines. It has been used in side drifts from 2 to 10 ft. high at the rate of 20 to 30 miles an hour with two mogul engines, and, in fact, met all requirements resulting from the severe winter and a line particularly exposed to trouble from snow. Of the four large snow plows now in use by us, it has proved by far the most satisfactory."

Orders for Electric Motors.

The Atlantic Avenue Railroad Company, of Brooklyn, has contracted with the Westinghouse Electric & Mfg. Company for 400 electric motors for its new trolley cars. The order is said to be the largest of its kind ever placed.

Car Couplers.

A paper entitled "Results of Tests of Vertical Plane Couplers on Plan Proposed by the Master Car Builders' Association" will be read before the Western Railway Club on the 18th of April by Mr. G. W. Rhodes. The tests will be conducted by R. W. Hunt & Company, and all the coupler companies in the United States who are building vertical plane couplers have been invited to send couplers for the tests. The tests will commence at nine o'clock on the morning of Monday, April 10, and will be continued until completed. The pulling tests will be made at the Wells & French Company's works in Chicago, and the drop tests at the Sargent Company's works (formerly the Congdon Brake Shoe Company). It is the intention to take photographs of the couplers before and after the tests and illustrate the lecture with a stereopticon.

The Rathbun Car Works.

The opening of the works of the Rathbun Company at Deseronto, Ont., marks a new era in railroad car building in the Dominion of Canada. These works are equipped with the most modern machinery and appliances for time and labor saving, having been fitted up regardless of expense. The works will employ 1,000 men and besides building passenger and freight cars will also construct locomotives and ships for use on the Great Lakes. The proprietors of the Rathbun Company own 85 miles of railroad known as the Bay of Quinte Railway & Navigation Co., and also a line of steamers plying between Oswego and Deseronto.

Electric Lights for Chicago's Waterfront.

In the *Railroad Gazette* of March 10, 1893, it was stated that Congress had appropriated $20,000 for establishing a line of buoys, to be lighted by electricity, between Van Buren street and Jackson Park. It having been suggested that the system should be similar to that used at Sandy Hook, N. Y., the matter was referred to Captain Schley, in charge at that point, for his views on the subject. His report to the Lighthouse Board is as follows:

It would not be possible to employ the system used at Sandy Hook, because it would require too much wire and too heavy voltage to reach the buoy from the point where the system would take hold of the source of power on shore. Two plans are therefore suggested, but of the two available systems there is no possibility whatever that the necessary conducting cables can be manufactured under 60 days from the time of giving the order. The first plan is the laying of four single-armor, three conductor cables from a subway on shore parallel to the line of buoys carrying a two-conductor cable, insulated and covered with lead. These cables, connected with the subway, running out to the position boxes near the line of buoys, would include three buoys in the work of each cable. To construc

this system would cost $16,000, not including the cost of laying buoys with fittings, hundred candle-power lamps or lanterns, and expenses of transportation to Chicago. The second plan, and the best, would be to run separate lines of single conductor, single armor, from a two conductor cable covered with lead and placed in a subway along the beach directly to each buoy of the system. This plan, which is the most feasible, practicable, and least expensive, would require about seven teen and one-half miles of cable and would cost $13,000. Other expenses for equipment and maintenance would not exceed $5,000, leaving a margin of $2,500 for laying the subway cable in Chicago.

The second plan will probably be adopted and the work will begin as soon as necessary arrangements can be made. If the expenses of construction exceed the appropriation the city of Chicago will be called upon to help defray the expenses.

The "Naronic."

The *Marine Journal* has started the story that the "Naronic" carried on deck a 40-ton locomotive and a train of cars, and suggests that the vessel turned bottom side up largely on account of this heavy deck load. The *Marine Journal's* theory as to the stability of the ship is in itself faulty, but the premises are even more so. As a matter of fact the "Naronic" did not carry a locomotive and train of cars on her deck or in her hold. The "Runic" of the same line brought over a 45-ton locomotive and a 13-ton tender stowed below, and two carriages on deck, all of which were safely landed in New York and reached Chicago March 18, as previously duly chronicled in the *Railroad Gazette*.

Slotted Conduit Electric Railroad.

A new scheme for an electric railroad for Vienna has been proposed by Messrs. Siemens & Halske. The line is to be on the slotted conduit system, with underground conductors, and is to encircle the inner town with a branch line to the centre of the city. This method of carrying the electric current underground is said to be giving good results in Buda-Pesth, where, however, a portion of the existing horse car lines are to be converted into trolley roads.

New Ferry Boats.

One of two new double-deck, screw ferry boats, the "Easton," built for the Central Railroad of New Jersey by the Harlan & Hollingsworth Company, of Wilmington, Del., has just been completed, and will reach New York probably within a week. The other boat, which will be named "Mauch Chunk," is exactly the same design and size, and is expected to be ready for service in about a month. Each boat has a screw at both ends, and is 158 ft. long over all, with a molded beam of 32 ft.; beam, over guards, 54 ft., and depth of hold, 14 ft. 4 in. Each has a double compound engine with high-pressure cylinders 6 in. in diameter; low-pressure cylinders, 30 in. in diameter, and a stroke of 22 in. Steam at 100 lbs. pressure will be furnished for each boat by two 8 ft. × 19 ft. boilers. The propellers are 7 ft. in diameter. Both boats are fitted up with Martin's steam steering gear, and each has also an 8½ in. × 10 in. McEwen automatic engine for electric light use. The interior finish of the lower cabins is in oak, and that of the upper saloons is in butternut. The boats are intended for service between the station at Communipaw, N. J., of the Central Railroad and the foot of Whitehall street, New York City.

The La Burt Car Coupler.

The La Burt Automatic Block Signal System & Car Coupler Co., No. 203 Broadway, New York, has just issued a neatly illustrated eight-page pamphlet, giving detailed information respecting the La Burt automatic vertical plane coupler, an illustrated description of which was published in the *Railroad Gazette*, Jan. 27, 1893. At a recent meeting of the company the following named officers were elected: President, H. Grasman; Treasurer, W. H. Agricola; Manager, J. La Burt; Secretary, A. M. Lowry. The company is now prepared to fill promptly all orders for the coupler.

Duplex Mallet Compounds.

In 1891 the locomotive works of J. A. Maffei, of Munich, delivered to the Swiss Central Railroad six compound duplex locomotives. The same works are now building ten more for the same road. These engines are compounded on the Mallet system and articulated. They have eight drivers and no engine trucks.

A Novel Bascule Bridge.

A novel design of bascule bridge is somewhat adequately described and illustrated in *Industries*. It was recently constructed by Messrs. Somervail & Co., Dalmuir Iron Works, Dalmuir, N. B., and is intended for export to the East.

The special feature in the bridge consists in the raising of the centre bays, two on either side of the middle of the structure by means of chains working through blocks attached to the upper booms and terminating in winches placed on shore. Each bascule is actuated by a pair of chains, and there are thus four winches altogether. The space thus given for passing vessels is over 28 ft., and with a headway extending right up to the upper boom. These bascules are suspended from arches having a span of 85 ft. 3 in. from centre to centre of bearing pins, spaced 29 ft. 6 in. apart, with a rise of 30 ft 3 in. at the centre above the level of the bearing pins.

Creosoting Cars after Erecting.

A plant has been constructed at the London & North-Western Railway Company's Works, Crewe, and installed at their car works at Earlestown for the purpose of creosoting coal and cattle cars after they are put together. There is a cylindrical creosoting chamber, 12 ft. 6 in. internal diameter by 22 ft. long, made of ⅝ in. steel plates, and there are storage tanks for holding the creosote, which are placed below ground close to the creosoting chamber, to which they are connected by pipes. The chamber is fitted with a glass gauge, pressure gauge, and escape valve loaded to give a pressure inside the chamber of 100 lbs. per square inch. At one end of the chamber is a door or cover, which is supported by a crane fixed to the side of the chamber; when closed it is firmly held in position by 48 cast steel cramps, which are hinged to the chamber, the joint between the cover and the chamber, which is of the ordinary external and internal type, being made with lead. Rails are fixed inside the chamber on which the car to be creosoted is run on its own wheels. As soon as a car has been run inside and the end cover made secure, a vacuum is created in the chamber by means of a Meldrum ejector, at the same time the creosote in the storage tank rises through the pipes into the chamber. As soon as it is almost filled, the connections with the ejector and storage tanks are closed by means of sluice valves, and connection opened to a force pump, which fills the chamber and raises the pressure to 100 lbs. per square inch, the whole operation lasting about 20 minutes. The car is kept under pressure in the chamber for three hours, after which the sluice valve at the bottom of the chamber is opened, and the creosote runs back into the storage tanks. The car is then removed from the chamber and placed over a channel to drain the creosote, which is carried back to the storage tanks. The springs of the vehicles are removed while the latter are in the chamber.

A Big Dredger for the Mersey.

A twin-screw hopper and sand-pump dredger, the "Brancker," was lately launched from the shipbuilding yard of the Naval Construction & Armaments Company, Barrow. This vessel was built to the order of the Mersey Docks & Harbor Board, who have been so satisfied with the experiments made in cutting a channel through the Mersey bar that they have determined to further proceed with dredging operations in the hope that the steamers of the largest tonnage may be enabled to enter the river at any state of the tide. The vessel was designed and constructed under the direction of Mr. G. F. Lyster, engineer to the Board. Her length between perpendiculars is 320 ft.; breadth, molded, 46 ft. 10 in.; depth, molded, 20 ft. 6 in.; gross register tonnage, 2,560 tons. She is built of steel to Lloyd's highest class, and has amidships eight large hoppers (four on each side of the vessel), having a total capacity of 3,000 tons of sand. A well is formed in the centre of the ship, between the hoppers, to admit of working of a sand-pump suction tube 3 ft. 9 in. in diameter through the bottom of the vessel. This tube is raised and lowered by hydraulic pressure, and when lowered can dredge to a depth of 45 ft. Large rectangular landers are fitted above the hoppers, with openings over each compartment to allow of spoil being distributed on the hoppers as required. Two large centrifugal pipes, having suction and discharge pipes 3 ft. in diameter, will be fixed, capable of raising 4,000 tons of sand an hour. These pumps are driven by triple expansion engines, having cylinders 11½ in., 18 in. and 29 in. diameter by 18 in. stroke, and which work at 160 lbs. steam pressure. Rudders are fitted forward and aft, controlled by steam steering gear. The vessel will be propelled by twin screw inverted triple expansion engines. Mr. Crowe, the chairman of the Marine Committee of the Mersey Harbor, has remarked that he felt quite sure the new vessel would enable the Board to deepen the bar 24 or 25 ft. in 12 months and thus open the river to the largest class of ships at any state of the tide. The depth of water at the bar has already been increased to 18 ft., with the result that the Cunarders are, for the future, to leave at a fixed hour every Saturday, instead of having to regulate the time of departure by the state of the tide.

THE SCRAP HEAP.

Notes.

The rate for Pullman tourist sleeping cars when chartered by the day will hereafter be $25 instead of $15.

The Delaware & Hudson Canal Company has retired a Paymaster and a Superintendent of Docks on pensions.

A Buffalo paper states that track foremen on the Erie have been ordered to patrol their sections on Sunday in person, instead of sending one of their men.

The Superintendent of the Southern Pacific in Oregon has had to apply to the United States Marshal for officers to protect a gang of Japanese track laborers who were stoned while at work, and otherwise abused.

Mr. B. Jeans, a passenger train conductor (guard) on the Great Western of England, has been a passenger guard for 50 years, having joined the service in 1842. He is 74 years of age, and is said to have traveled 3,494,452 miles.

The roads between Chicago and the Missouri River have agreed to raise the price of meals in dining cars, and after April 1 it will be $1 instead of 75 cents as heretofore. This will make the rates uniform with those on most, or all the other dining car lines in the country.

D. B. Reed, for 15 years Traveling Auditor for the Union Pacific in Colorado, and latterly also in New Mexico, was arrested last week on a charge of embezzlement. It appears that he borrowed money, $1,700 in all, from 15 different agents, whose accounts he examined, telling them to treat his I. O. U. as cash. The fraud was discovered by accident.

The Pennsylvania discharged five ticket sellers at the Cortlandt Street Ferry, New York City, last week. It is said that tickets taken up by collectors had been resold. The New York Central has discharged 13 passenger conductors. It is reported that they had conspired with drummers to permit the use of tickets a second time.

It appears that there has been a strike of trainmen on the Atlantic & Pacific, but the press dispatches give no reliable information as to its extent. The company has dismissed a good many men, and United States marshals were employed last week to guard mail trains. There has been a strike of brakemen on the Texas Central, but it appears to have been quickly settled.

The passenger cars of the Northern Central, the Baltimore & Potomac, and other lines controlled by the Pennsylvania are being lettered "Pennsylvania," the initials of the owning road being shown in small letters. This change should be an agreeable one to passengers. It looks somewhat incongruous to see a car in a local train at Pittsburgh lettered "Baltimore & Potomac."

A young woman of Chicago is emulating "Nellie Bly," on what may be called a semi-domestic scale, having been put up to it by a passenger man. She left Chicago March 22 on a trip, the itinerary of which is as follows Chicago to Portland, Or., Northwestern & Union Pacific; thence to San Francisco, Southern Pacific; to El Paso, Southern Pacific, to City of Mexico, Mexican Central; to Laredo, Mexican National; to St. Louis, International & Great Northern, Texas & Pacific, and Iron Mountain; to New York, Wabash, Michigan Central, New York Central; to Boston, New York, New Haven & Hartford; to Chicago, Boston & Albany, New York Central, Michigan Central. Several railroad men were talking about famous trips that had been made and the conversation drifted to a discussion of the excellence of through car arrangements and union station accommodations; and a passenger agent, to convince doubters, made the boast that a woman could make such a trip as has been outlined, without finding it necessary to put her foot on the ground.

World's Fair Notes.

There will be exhibited two modern English locomotives, two German and four French. The London & Northwestern locomotive referred to in these notes last week has already arrived, also four German cars.

The Reeves Pulley Company, of Columbus, Ind., will exhibit what is supposed to be the largest wood split pulley in the world. It is 18 ft. in diameter and the rim is 4 ft. wide. It required 2½ kegs of nails and 100 pounds of glue to unite the 2,800 pieces of which it is composed.

An interesting exhibit will be that of Purdue University, Lafayette, Ind., the feature of which will be a full truss bridge, all constructed by students. Working machinery used in the mechanical and electrical engineering departments of the University will also be in in place.

Work began Monday on the fine painting of the exterior of the big buildings. The first to be painted was the Manufacturerers' Building, the color of which will be a pale cream. The Transportation Building is being decorated in several colors. The remaining buildings will be almost uniformly of a pale cream color.

The Philadelphia & Reading will send to the World's Fair the first locomotive used on that road. The Old Colony will send a model of the steamship "Puritan," a locomotive of 1858, and one of the first passenger cars used on the Boston & Providence. The Westinghouse Air Brake Company's exhibit has just been shipped to Chicago. It occupied six cars.

The miniature mail car built at the shops of the Chicago, Milwaukee, St. Paul railroad company for exhibition at the World's Fair is complete. The car is ten feet long, and the cost was $2,500. In every detail it is exactly one-sixth the standard mail cars of the company. One side is left partly open to show the framework. The other side is entirely inclosed, and upon it is the name of the car, "Grover Cleveland." The interior will be lighted by electricity.

What is said to be the largest storage battery charging plant ever erected in this country has just been contracted for by the Exposition management. The General Electric Company got the contract. The plant will be used for charging the storage batteries of the electric launches used on the lagoons and will be sufficient in capacity to charge at one time 60 electric launches, each having a capacity of 78 cells. This will be equivalent to a current sufficient to maintain 6,000 incandescent lamps.

The Installation Department met its largest job a few days ago when it began unloading the 2,000-H. P. Allis engine. A train of eight cars was required to bring it from Milwaukee. One of the pieces weighed 30 tons and when Superintendent Haley found that its weight was 10 tons greater than the capacity of the traveling crane, he realized what a task he had. The engine is to run two Westinghouse dynamos, each having a capacity of 16,000 incandescent lights.

The Ohio pavilion, in the Mines and Mining Building, is constructed entirely of stone and brick from that state. There will be between 300 and 400 representative specimens in the walls. A large part of the material inside is from the coal mines of the state. One block of coal will show a vein 9 ft. thick. Thirty different grades of coal produced in the state will be shown. Petroleum will be exhibited, as will be paraffine, coloring materials and all the products of petroleum. A general exhibit of scientific mining will be made by the State University.

Foreign Notes.

In order to be certain, in rail mills, of always sawing off rails at practically the same temperature so as to insure uniform rail lengths after cooling, some foreign makers, according to the *Revue Industrielle*, use colored glasses through which the rails, at a certain temperature, become invisible. They can be cut at that particular moment and the object sought thus attained.

Artificial fuel, so-called, made up of coal dust and some kind of suitable binding material, the mixture being molded into briquettes, is again attracting special attention in Russia, and an extensive development of this method of utilizing coal waste is there promised. Ordinary coal in some of the districts is sold at very high prices, much to the disadvantage of the metallurgical industries, and it is hoped that the artificial fuel, which, relatively, will be very much cheaper, will have an important beneficial effect on them. The coal dust deposits of the Russian Navigation Society at Batoum are to be drawn upon for the manufacture of the fuel, while naphtha residues will be used for binding material.

A species of heliograph called "telephote" is described in the *Revue Scientifique*. It comprises a telescope signal mast, capable of being extended to a length of 8.2 metres (about 27 ft.), on which are mounted 106 elec-

tric incandescence lamps, each of 32 candle power, though more powerful lamps may be used on higher masts if desired. The lamps are connected with a switchboard so that they may be thrown in or out of circuit to form Morse alphabetic characters as desired, and thus made to transmit visible messages from one station to another. A Morse dot in this telephote is made up of two lamps, and a dash, of 20 lamps, having a combined length of 1½ metre (about 5 ft.). The dark spaces between the dots and dashes also will measure about 5 ft. Two red lamps indicate a period. The apparatus is said to have a working transmitting speed of 72 letters a minute. The signals are said to be easily visible during the daytime at a distance of about three miles, and at night over a distance of nearly 10 miles. As a military and signalling device the apparatus is thought to be of considerable value.

Experiments have recently been made at Hamburg, by the German Shipping Co., with Professor Schirm's magnesium light for seaboard illumination, to which brief reference has already been made in *The Railroad Gazette*. The trials are said to have given highly promising results and to have demonstrated that the new light is far superior as a lighthouse illuminant to even the best available electric outfit. It may not be amiss, therefore, to again recall some of the particulars of the light. The whole apparatus is about 7 ft. high and 3 ft. in diameter. In its interior a small air blast is arranged, the air being forced through pumice stone thoroughly saturated with benzine. The resulting stream of benzine vapor or gas is then made to take up a certain proportion of fine magnesium powder and the whole mixture finally is led upward in a vertical pipe and is burned in a small flame which is stated to have an enormous lighting power. The whole apparatus is operated by clockwork and is protected against atmospheric influences by a glass case. The consumption of magnesium varies with the desired light intensity from about 14 to 36 grammes an hour. Good evidence of the merit of the invention would seem to be afforded by the published statement that the London Trinity House has erected an experimental station for the use of the light at Folkestone.

Chesapeake & Ohio Canal.

The Chesapeake & Ohio Canal, which has been closed since early last winter, was re-opened last week for traffic. Twelve new boats went into service, besides all the old ones that were in use last season.

Railroads in Egypt.

The Railway Board have decided to spend about a million and a quarter pounds sterling in extensions in Upper and Lower Egypt. It is intended to prolong the existing line from Ghirgheh to Keneh, and thence by narrow gauge to Luxor.

A Tank Drama in One Act.

Edward Fuller, of Philadelphia, got on a Pennsylvania train at Broad street station the other day, intending to get off at a suburban station. Instead of getting on a local train he boarded the Cincinnati and St. Louis express, getting between the tender and baggage car. He could not jump off, and was sitting on the platform when the locomotive scooped up water from the tank between the rails. As the tank in the tender filled up it overflowed and almost drowned Fuller, who, to escape, opened the baggage car door and entered the car. The huge volume of water poured in after him and deluged the car, destroying the contents of several trunks. Fuller was arrested when the train reached Harrisburg, and is now in jail for malicious mischief.

A Luxurious Train.

A luxurious train left New York on Wednesday of this week, carrying Dr. Seward Webb, his family, and a few invited guests to the Pacific Coast. The train constitutes a hotel on wheels. It includes Dr. Webb's private car Ellsmere, said to be the most sumptuous product of the Wagner Company, the private car Idler, the new observation car Ne Ha Sa Ne, the compartment car Daphne, a dining car, and a combination car to carry the help and the baggage.

The five private cars are richly furnished, and each is especially equipped for this trip. The larder of the dining car is well stocked with every seasonable delicacy. The private car Daphne will be used almost exclusively by Mrs. W. Seward Webb and her three small children. In it there is a spacious playroom, which resembles an attractive toy shop. There will be 15 colored attendants in uniform on the train.

The party will go to Chicago, and from there to New Orleans. Then they will make their way leisurely to Southern California; thence to San Francisco, Sacramento and other places, and on to Vancouver, B. C. They will return over the Canadian Pacific, stopping in Chicago until they tire of the World's Fair, and then they will go directly to Dr. Webb's country home at Shelburne, Vt.

The Newest Waterway to New York.

The bill incorporating the North American Canal Company was passed March 27 by the Dominion Parliament. The company is to construct a canal from Lake Erie to Lake Ontario, deepen the St. Lawrence canals and cut the canal from Lake St. Francis to Lake Champlain and thence to the Hudson River in order to provide a new waterway to New York. This project was described in a recent issue of the *Railroad Gazette*. We do not regard it as imminent.

Pennsylvania Railroad Voluntary Relief Department.

The seventh annual report of the Pennsylvania Relief-Department has just been issued.

The accessions to membership during 1892 were 9,225, exceeding the deaths and withdrawals by 8,628. There were 4,188 members who left the service of the road. The net gain in membership was 4,440, and the total at the close of the year was 31,640. The death rate during the year was equal to 15.1 per 1,000 members, and the average number of members constantly disabled was equal to 49.1 per 1,000.

The surplus fund amounts now to $219,954. During 1892, 97 benefits for deaths from accident amounting to $64,916 were paid and 267 for deaths from natural causes amounting to $151,492; for disablement from accident, 8,298 benefits amounting to $90,242, were paid, and 19,140 for sickness, amounting to $170,843. The superintendent of the department is J. A. Anderson, Trenton, N. J.

Fall of a 20-ton Girder at Elizabeth.

Work on the Pennsylvania elevated, at Elizabeth, N. J., has progressed steadily during the past week. The temporary trestle has been set up across Rahway avenue. The foundations at the Broad street-Morris avenue crossing are all completed and the timber falsework to support the plate girders, with which these crossings are to be temporarily spanned, is all up.

A peculiar accident Wednesday morning caused some delay. The girders were being put in place on the temporary wooden abutments of the east span of the North Broad street crossing by means of a traveling crane consisting of a hoisting engine mounted on a flat car. The car was run out on a temporary trestle spanning the gap and was provided with timber cradles, bolted to the platforms, from which the girders were suspended and thus carried into position. Two girders, each about 50 ft. long and weighing about 20 tons each, had been successfully placed. When the third was almost in position to be lowered on to the abutments one of the chains supporting the outer end parted, letting that end of the girder down to the ground, about 18 ft. below. The other end held and the girder, by its leverage, caused the crane car to topple over on the two girders already in place, shoving one of them out of position, but not to the ground; the third one held and these saved the entire apparatus from falling on the top of a freight train which was passing on the tracks alongside at the time. The boom of the crane swept over the tops of the freight cars. Several of the laborers were thrown to the ground and received slight injuries.

LOCOMOTIVE BUILDING.

The Schenectady Locomotive Works is building five ten wheel locomotives for the Central Vermont.

The Louisville & Nashville has let a contract for 15 consolidation locomotives to the Rogers Locomotive Works.

The Baltimore & Lehigh is about to place orders for 12 standard gauge locomotives to be delivered in September.

The Cleveland, Lorain & Wheeling has recently placed an order with the Brooks Locomotive Works for eight freight locomotives.

The Cooke Locomotive & Machine Co., of Paterson, N. J., has orders for 14 ten-wheel engines from the Southern Pacific, and for six eight-wheel passenger and two switching engines from the Chicago & Grand Trunk.

The Richmond Locomotive & Machine Works is building 10 ten-wheel locomotives for the Cleveland, Cincinnati, Chicago & St. Louis, and also two passenger and five switching engines for the Chesapeake & Ohio.

The Chicago & West Michigan and the Detroit, Lansing & Northern, which are operated under one management, will probably order during the year ten 10 wheel freight locomotives and four 6-wheel switching locomotives.

CAR BUILDING.

The Wabash is in the market for 1,000 freight cars.

The Baltimore & Ohio is asking bids on 1,600 freight cars.

The Kansas City, Fort Scott & Gulf will ask for bids on 500 cars.

The Union Pacific is said to be in the market for 1,500 freight cars.

The Boston & Albany has issued specifications for 1,000 freight cars.

The Columbus, Hocking Valley & Toledo is in the market for 500 cars.

The Boston & Maine will, it is reported, soon give out contracts for 2,000 cars.

The Missouri Car & Foundry Co. has received an order for 1,000 freight cars from the Missouri Pacific.

The Mount Vernon (Ill.) car works have an order for 200 cars from the Monterey & Mexican Gulf road.

The Seaboard Air Line contemplates putting on new vestibule trains and the orders for the cars will be given out shortly.

The Barney & Smith Manufacturing Co., of Dayton, O., has an order for 250 cars for the Merchant's Despatch Transportation Co.

The Philadelphia & Reading will build a passenger car costing $8,660 and a baggage car costing $5,595 for the Royal Blue Line trains.

The Marshall Car Wheel & Foundry Co. has an order for six box and 15 platform cars, to be built for the Paris, Marshall & Northwestern road.

The Philadelphia & Reading is reported to have arranged this week with the Pullman Car Company for 10,000 freight cars, chiefly gondolas.

The Live Poultry Transportation Co. has contracted with the Terre Haute Car & Mfg. Co. for the construction of 50 poultry cars, Jennings' patent.

The Louisville & Nashville has ordered 1,500 freight cars, dividing the order between the Mt. Vernon Car Company, the Elliott Car Company and the United States Car Company. The latter company is to build 70 cars at its shops at Anniston, Ala.

The Baltimore & Lehigh is negotiating for about 200 standard gauge freight cars to replace its present narrow gauge equipment. The company will also order 14 passenger cars, three combination passenger and baggage cars. The New York Equipment Co will probably secure the order for the entire equipment.

General Manager Charles M. Heald, of the Chicago & West Michigan Railroad, states that the equipment of the railroad company will be increased this year by building 10 passenger cars, 1,000 box cars of 30 tons capacity, 200 platform cars and also seven cabin cars. Five hundred of the box cars will be for the Detroit, Lansing & Northern Railroad.

Mr. John Dixey, formerly Superintendent of the Passenger Car Department of Pullman's Palace Car Company at Pullman, Ill., has accepted the superintendency of the shops of the Muskegon Car Company at Muskegon, Mich. This company failed some time ago, but the works have been recently purchased by McCracken & Hobey, a wealthy lumber firm of Michigan. The shops have been entirely overhauled and equipped for turning out 10 freight cars a day.

BRIDGE BUILDING.

Albany, N. Y.—Governor Flower has signed the following bridge bills: Appropriating $5,000 for the construction of bridges over Twitchell Creek, near Stillwater; appropriating $3,500 for a canal bridge to replace the present structure at Ann street, Little Falls.

Harrison County, W. Va.—The contract for the erection of a new highway bridge over Hackers Creek, in this county, was let by the County Court last week to J. J. Spencer and J. U. Dayton at their joint bid for the stone work and superstructure of $2,728.

Minneapolis, Minn.—The engineers of the Great Northern have prepared plans for the proposed railroad bridge over Como and Tenth avenues at this place. The city engineer has requested certain modifications in the plans as presented.

A bill is now pending in the legislature authorizing the issuance of 4½ per cent. bonds for building a two-track iron truss bridge, with suitable sidewalks, across the Mississippi River at 32d avenue north, Minneapolis.

Norwich, Conn.—The Berlin Iron Bridge Co., of East Berlin, Conn., has received the contract for a new bridge at Norwich, Conn., to span the tracks of the Norwich & Worcester Branch of the New York & New England Railroad over the Shetucket River. The bridge will consist of one span of 145 ft., with a roadway 24 ft. wide in the clear and two sidewalks each 5 ft. wide in the clear. The roadway and sidewalks will both be covered with steel buckle plates and concrete.

Ottawa, Ont.—The last span of iron superstructure of the new bridge over the Rideau River was put into position on Saturday of last week, and it is expected the bridge will be ready for travel by April 1.

Spokane, Wash.—Plans have been prepared for building three bridges in Spokane. At the first crossing a steel bridge is to be built, having two spans of 154 ft. each. The approaches are trestlework, each being about 300 ft. long, making the total length of the bridge 900 ft. The second bridge will be a deck bridge with 60 ft. plate girders. The third bridge is the same style as the first and will be nearly as long.

Vancouver, B. C.—Tenders are wanted for the construction of a bridge over Nicomeki River at Elgin, B. C.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago, Rock Island & Pacific, quarterly, $1, payable May 1.
Evansville & Terre Haute, quarterly, 2½ per cent. on the preferred stock, payable April 24.
Freehold & Jamesburg Agricultural, 3 per cent., payable April 1.
Manhattan, quarterly, 1½ per cent., payable April 1.
Keokuk & Western, semi annual, 1 per cent., payable April 1.
New Castle & Beaver Valley, quarterly, 1½ per cent., payable April 1.
New York Central & Hudson River, 1¼ per cent., payable April 15.
New York & Harlem, semi-annual, 2½ per cent, on the common and preferred stock, payable April 1.
Norfolk & Southern, quarterly, 1 per cent., payable April 10.
Pennsylvania, semi-annual, 2 per cent.
Pittsburgh, Cincinnati, Chicago & St. Louis, semi-annual, 2 per cent. on the preferred stock, payable April 17.
Rio Grande Western, quarterly, 1¼ per cent. on the preferred stock, payable May 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atlantic Avenue Elevated, annual, Brooklyn, N. Y., April 18.
Chicago & Alton, annual, Chicago, Ill., April 3.
Fort Worth & Rio Grande, annual, Fort Worth, Tex., April 4.
Joliet & Chicago, annual, Chicago, April 3.
Louisville, New Albany & Chicago, special, Indianapolis, Ind., April 12, to consider an increase of stock.
Mexican Central, annual, Boston, Mass., May 3.
Mohawk & Malone, special, Albany, N. Y., April 19, to approve of the lease to the New York Central & Hudson River.
New York Central & Hudson River, annual, Albany, N. Y., April 19
New York, New Haven & Hartford, special, New Haven, Conn., April 4, to ratify the lease of the Old Colony.
Northern Pacific, special, New York City, April 20.
Panama, annual, New York City, April 3.
Pittsburgh, Cincinnati, Chicago & St. Louis, annual, Pittsburg, Pa., April 11.
Southern Pacific, annual, San Francisco, Cal., April 5.
Southwestern, special, Macon, Ga., April 12.
Staten Island Rapid Transit, annual, New York City, April 25.
Tennessee Coal, Iron & Railroad Co., biennial, Tracy City, Tenn., April 4.
Union Pacific, annual, Boston, Mass., April 26.
Union Pacific, Denver & Gulf, annual, Denver, Col., April 11.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Western Railway Club* meets at the rooms of the Central Traffic Association in the Rookery Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 7:30 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel St. Paul, on the second Tuesday of each month, except during June, July and August, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Western Society of Engineers* meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Odd Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets

at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The Denver Society of Civil Engineers meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday except during the months of June, July, August and September.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Tacoma Society of Civil Engineers and Architects* meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The *Association of Engineers of Virginia* holds informal meetings the third Wednesday of each month, from September to May inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Civil Engineers' Association of Kansas* meets at Wichita, Kan., on the second Wednesday of each month, at 7:30 p. m.

The *American Society of Swedish Engineers* meets at the clubhouse, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

Engineers' Club of Philadelphia.

At the meeting of the Club to be held on Saturday, April 1, 1893, at 8 o'clock p. m., a paper on "The Preparation of Portland Cement, and the Various Systems of Burning the Cement," by Pierre Giron, is announced.

At the regular meeting on March 18, Vice-President James Christie was in the chair; 55 members and visitors were present. Mr. Geo. S. Webster exhibited, by means of the projecting lantern, a series of photographs of all the important bridges in Philadelphia that had been built by the City Survey Department, and described their principal dimensions and interesting engineering features.

General Passenger Agents' Association.

The annual meeting of the American Association of General Passenger and Ticket Agents was held at Harrogate, Tenn., March 23. The principal address, by George H. Heafford, was printed in the *Railroad Gazette* last week. A committee of five was appointed to report at the next meeting a plan for the institution of a board of arbitration for the more equal division of rates by connecting lines. Plans for a uniform settlement of ticket accounts were discussed, but no action was taken further than to instruct the passenger agents to confer with the auditors relative to this point. A resolution was adopted to the effect that in all cases where, by error or otherwise, an agent has sold a coupon ticket for less than the legal rate, relief shall only be granted on approval of the General Passenger Agent of the initial line. The following officers were elected: President, F. Chandler, of the Wabash, St. Louis; Vice-President, J. C. Anderson, New York, Ontario & Western, New York; Secretary, A. J. Smith, Lake Shore & Michigan Southern, Cleveland. The new executive committee is as follows: J. C. Pond, Wisconsin Central; D. G. Edwards, Queen & Crescent, and J. R. Buchanan, Sioux City & Pacific. W. A. Thrall, of the Chicago & Northwestern, was chosen to make the semi-annual address at the next meeting.

Rensselaer Polytechnic Institute.

A very interesting lecture on "Specifications" was delivered at Troy, March 29, by Theodore Cooper, of the class of 1858 of the Rensselaer Polytechnic Institute, before the students of that institution.

Traveling Engineers' Association.

This association (for road foremen of engines and all who perform the duties of that office regardless of their titles) has been permanently organized, with 67 members.

The officers are: President, C. B. Conger, Grand Rapids, Mich.; First Vice-president, J. W. Sheldon, Renovo, Pa.; Second Vice-president, W. R. Davis, Chicago, Ill.; Secretary, W. O. Thompson, Elkhart, Ind.; Treasurer, W. E. Miller, Terre Haute, Ind. The members of the Executive Committee are: A. S. Work, Fort Wayne, Ind.; J. D. Vantwood, Kaukaunna, Wis.; W. T. Hamar, Atlanta, Ga.

The following committees have been appointed:

On economical use of oil and supplies: M. M. Meehan, J. S. Bauder, W. E. Miller.

Examination of firemen for promotion, and new men for employment: J. D. Vantwood, N. M. Maine, W. A. Murdock.

Double crewing and pooling engines: W. T. Simpson, W. J. Anthony, J. W. Sheldon, W. T. Hamar, D. R. McBain.

Instruction in air-brake practice: J. E. Goodman, M. M. Dodd, Geo. H. Brown, J. W. Shannon, A. B. Burdett.

Testing coal: N. S. Moore, Geo. O. Taylorson, T. J. Hennessey.

The annual meeting will be held at Chicago, Sept. 12.

PERSONAL.

—Mr. James G. Dagron has resigned as Engineer of Bridges of the Baltimore & Ohio.

—Mr. J. F. Babbitt, Jr., Purchasing Agent of the Central Railroad of Georgia, has resigned, the resignation taking effect April 1.

—Mr. H. F. Hawley, for 11 years Assistant Superintendent of the Chicago Division of the Chicago & Alton, has resigned, taking effect April 1.

—Thomas Agudio, an eminent Italian engineer, known especially for cable mountain railroads which he designed and built, died in Turin Jan. 8 at the age of 66.

—Mr. C. C. Elwell, Engineer of Maintenance of Way, Pittsburgh Division, Baltimore & Ohio Railroad, has tendered his resignation to accept a position with the New York, New Haven & Hartford.

—The Chevalier Otto von Böhn, head of the traffic department of the Bavarian State Railroad, widely known as an authority on railroad rates, died in Munich Jan. 19, aged 56.

—Mr. R. McSmith, for 10 years in the service of the Chicago, Burlington & Quincy road as Traveling Passenger Agent in the Michigan district, has resigned to become Traffic Manager of the Movable Sidewalk Company at the World's Fair.

—Mr. George W. Kramer having resigned, Mr. Dudley D. Mayo has been appointed Acting Manager of the Denver & Rio Grande Express, to take effect April 1. Mr. Mayo has filled the position of Denver agent of the Denver & Rio Grande Express Co. for eight years.

—Mr. J. G. Taylor, General Live Stock Agent of the Atchison, Topeka & Santa Fe, with office at Kansas City, Mo., has resigned, taking effect April 1. Colonel Taylor has been in the service of the company for a number of years, but has been in ill health for the last year.

—Mr. Earl Stimson, who is a brother-in-law of President Ingalls, of the Cleveland, Cincinnati, Chicago & St. Louis road is mentioned as the probable new Purchasing Agent of the company. He was formerly a resident of Cincinnati, but for some time has been located in Los Angeles, Cal.

—Mr. E. V. Newlin, formerly General Freight and Ticket Passenger Agent of the Fort Worth & Denver City, has been appointed General Manager of the California Fruit Express Co. He is also General Freight Manager of the Earl Fruit Co., which controls the former company.

—Mr. George W. Saul, President of the Ohio Southern Railroad was elected President of the Cleveland, Akron & Columbus at a meeting of the directors in New York City this week. Mr. M. W. Barse, of New York, who is Treasurer of the Ohio Southern, was also elected Treasurer at the same time.

—Mr. S. C. Hoge, Superintendent of the Georgia Southern & Florida, resigned last week, and the Receiver, W. B. Sparks, announces that the office will be abolished. Mr. Hoge has been connected with the railroad from the time when it was placed in operation about five years ago.

—Mr. J. H. Garaghty, late Purchasing Agent of the Cleveland, Cincinnati, Chicago & St. Louis, has been appointed General Superintendent of the Griffin Foundry & Car Works of Chicago, of which company Mr. W. M. Greene, late General Manager of the railroad, is Vice-President and General Manager.

—Mr. A. E. Manchester, Division Master Mechanic of the Chicago, Milwaukee & St. Paul, at Dubuque, Ia., has been appointed Assistant Superintendent of Motive Power, with office at Milwaukee, Wis. The position of Master Mechanic at Dubuque, made vacant by the promotion of Mr. Manchester will be filled by G. H. Brown. These appointments are to take effect April 1.

—President Clark, of the Union Pacific, withdrew his resignation at a meeting of the directors of that company in New York City on March 29, at the unanimous request of the Board. Mr. Clark was elected President of the Missouri Pacific last week, and he will at once resign that office, and continue with the Union Pacific.

—Mr. A. A. Robinson, whose resignation as Second Vice-President and General Manager of the Atchison, Topeka & Santa Fe was noticed last week, denies the current newspaper reports that he is to become connected with the Union Pacific Railroad. Mr. Robinson states that he has not yet decided upon his future course, but that he will remain in the West.

—Mr. Charles Flagg, who since 1885 has been the General Manager of the Wagner Palace Car Co., has been elected Second Vice-President of that company. Mr. John A. Spoor, Division Superintendent in Chicago, has been appointed General Manager, and Mr. John C. Yager, Eastern Division Superintendent, has been promoted to be General Superintendent.

—The resignation of Mr. J. C. Matthews, as Superintendent of the Houston, East & West Texas Railroad, and of R. S. Collins, as General Freight and Passenger Agent of the same road, were announced last week. Both of these officers, however, retain their respective positions on the Houston & Shreveport road, a 40-mile line between Logansport and Shreveport. Both officers have been connected with the two roads mentioned above for about eight years.

—Mr. Frederick H. Smith, who died at Newark, N. J., March 25, aged 83 years, was during his business career connected with a number of insurance, railroad and other corporations. In 1852 he was elected Vice-President of the Central of New Jersey Railroad Company, and afterward became President of the Madison & Indianapolis Railroad of Indiana, continuing in this office until the road was merged in the Pennsylvania system, at which time he retired from active work.

—Mr. Grafton T. Nutter died at Boston March 23 at the age of 68. Mr. Nutter had had a varied career in railroad service. He began as a brakeman on the Grand Trunk. In 1850 he was conductor of the first freight train over the Suspension Bridge at Niagara Falls and soon after that was station agent of the Chicago, Milwaukee & St. Paul at Wheaton, Ill. Next he was Eastern Agent of the Chicago & Northwestern, where he stayed until 1873. While in Boston he was offered the position of General Freight Agent of the Union Pacific. Mr. Nutter patented the Nutter car hoist, which was used on many roads. Since 1875 he had been Agent of the Erie road in the freight department at New York, Boston and Providence.

—The eminent engineer M. Belpaire, member of the Belgian State Railroad management, died recently in Brussels at the age of 73. M. Belpaire was educated at the Central School of Arts and Trades in Paris, and as long ago as 1841 began his railroad career as Assistant Engineer in the transportation department, in which branch of the service he spent his life. He was at one time Manager of the State Railroad shops in Malines and later Manager of the Department of Transportation and Shop Service. At the convention of the Railroad Congress in St. Petersburg last summer he was made Vice-President. M. Belpaire was the inventor of an improved grate for burning small coal. This has been largely used in Belgium, especially in combination with the square-topped outside firebox known by his name.

—Mr. H. F. Royce, General Superintendent of the Chicago, Rock Island & Pacific, resigned this week and his resignation has been accepted at his urgent request, but he will remain with the company in an advisory position. Mr. Royce is one of the best known railroad men in this country, not only as an officer of the Chicago, Rock Island & Pacific, in whose service he has been for 40 years, but also through his work as a member of the General Time Convention, having served on many of its important committees, and as President for several years of the American Society of Railroad Superintendents. Mr. Royce has occupied nearly every position in the operating department of the Rock Island road, commencing in 1853 as check clerk. For three years previous to that he had also been in railroad service, at first on the Boston & Worcester road. On the Rock Island road he was conductor for a year, station agent for ten years, then Assistant Superintendent and Division Superintendent, becoming Assistant General Superintendent in 1883, and he has been General Superintendent of the lines east of the Missouri River since 1886. Mr. Royce's successor as General Superintendent is Mr. Charles Dunlap, General Superintendent of the lines west of the Missouri River. It is stated that he will also retain the latter position. Mr. Dunlap has been connected with the Rock Island road since 1887, resigning in that year as Division Superintendent on the Baltimore & Ohio in West Virginia to go as Superintendent on the western lines of the Chicago, Rock Island & Pacific.

—Mr. John Taylor Johnston, first President of the Central Railroad of New Jersey, died in New York City March 24, in his seventy-third year, of paralysis. Mr. Johnston was known not only as a railroad president, but an art collector, at one time owning what was the finest collection of paintings in this country, and as the founder of the Metropolitan Museum of Art in Central Park, New York, of which he was President until 1889. Mr. Johnston was born in New York in 1820, studied law, but practiced his profession only a few years, being elected when 28 years old President of the Elizabethtown & Somerville road, which is now a part of the Central of New Jersey system. With the development of this property and of the anthracite coal trade his business career was concerned. He was President of the railroad uninterruptedly from 1848 until 1877, when he lost most of his fortune in a vain attempt to preserve the credit of the company, through the disasters of that period which affected all the anthracite coal roads. He resigned the presidency of the road soon after it went into the hands of a receiver in 1877, and was never actively associated with it afterward. Mr. Johnston's management of the railroad was distinguished by enterprise, broad foresight and advanced ideas, and it owes to him the broad foundation on which it has been built up. He extended the system to the Delaware River, and his foresight led to the acquisition of the Lehigh & Susquehanna. He also secured the great terminal facilities of the company on New York Harbor. He advocated the building of the New York & Long Branch road, and initiated a policy of suburban development many years before other companies foresaw the importance of this traffic.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—J. F. Cassell, Engineer of Maintenance of Way, with headquarters at Grafton, W. Va., has been transferred to the Pittsburgh Division, succeeding C. C. Elwell, resigned to accept a position on another road. His office will be at Pittsburgh hereafter.

Burrard Inlet & Fraser River Valley.—A meeting of the shareholders was held at Vancouver, B. C., March 29. This is a local company, formed to build a line from Vancouver to Sumass to connect there with the Northern Pacific road. At the Vancouver meeting shares of the local company were transferred to H. S. Huson, Percy Dickinson and J. Q. Barlow, of Tacoma, and Mr. Ashton, the Western attorney for the Northern Pacific. The following officers of the new company were elected: C. D. Rand, of Vancouver, B. C., President; P. Dickinson, Vice-President; D. S. Wallbridge, Secretary; H. S. Huson, Treasurer; J. Q. Barlow, Engineer, and A. G. McCall, Solicitor.

Chicago, Burlington & Quincy.—John Lass, having resigned the position of Superintendent of the Galesburg division, W. B. Throop, Superintendent of the St. Louis division of the same road, has been appointed to the vacancy, while W. G. Besler has been assigned to Mr. Throop's place, with headquarters at Beardstown, Ill.

Chicago Great Western.—J. Berlingett, of De Moines, formerly Superintendent of the St. Joseph division, has been appointed General Superintendent of that company at Oelwein, Ia.

J. D. Tuohy, Superintendent of Terminals in Chicago, has been relieved of the duties of that office, having been appointed General Agent at Chicago.

Chicago, Rock Island & Pacific.—H. F. Royce having resigned as General Superintendent of lines east of the Missouri River, and having been assigned to other duties, Charles Dunlap, General Superintendent of lines west of the Missouri River, has been appointed General Superintendent of all of the lines of this company, with headquarters at Chicago.

Cincinnati, Hamilton & Dayton.—C. W. Fairbanks, of Indianapolis, Ind., Eugene Zimmerman, of Cincinnati, O., and M. C. Martin, of New York City, were re-elected directors at the annual meeting at Cincinnati last week.

Cleveland, Akron & Columbus.—The directors of the company met at the office of J. A. Horsey, No. 19 William street, New York City, March 28, and elected the following officers: George W. Saul, President; N. Monsarrat, Vice-President and General Manager; George W. Saul, M. W. Barse, N. Monsarrat, F. A. Barnaby, J. A. Horsey, H. B. Morehead and John S. Morton Directors; George W. Saul, M. W. Barse, N. Monsarrat, F. A. Barnaby and J. A. Horsey, Executive Committee. Last year Mr. Monsarrat was President and General Manager and J. A. Horsey was Vice-President.

Connecticut River.—H. E. Howard, of Springfield, Mass., for 22 years the General Freight Agent of the Connecticut River road, has just been appointed Division Superintendent of that line, which is now desig-

nated as the Connecticut River Division of the Boston & Maine system. W. E. Ray becomes Assistant Superintendent. Mr. Howard has been connected with the Connecticut River road for 30 years and Mr. Ray for 20 years.

Duluth, Mesaba & Northern.—A. F. Priest has been appointed Master Mechanic, with headquarters at Duluth.

Fitchburg.—John Quincy Adams, of Quincy, and David B. Kimball, have been appointed by Governor Russell, of Massachusetts, to be State Directors of the Fitchburg road.

Georgia Southern & Florida.—W. M. Craven, of Macon, Ga., formerly Chief Train Dispatcher, has been appointed Master of Trains, vice S. C. Hoge, resigned. The office of Superintendent, also held by Mr. Hoge, has been abolished.

Gulf, Colorada & Santa Fe.—At the annual meeting at Galveston, Tex., March 21, the following directors were elected: George C. Magoun, Chairman, New York; Joseph W. Reinhart, Boston; John J. McCook, New York; and George Sealy, John H. Hutchings, Bertrand Adoue, Leon Blum, T. W. Terry and T. W. Jackson, of Galveston.

Houston, East & West Texas.—H. W. Downey and James Appleby who were recently appointed receivers for this road have announced that the offices of Superintendent and General Freight and Passenger Agent have been abolished. The Operating Department will hereafter be in charge of Receiver H. W. Downey and traffic matters in charge of Receiver James Appleby.

Macon & Northern.—S. C. Hoge has been appointed Superintendent, with office at Macon, Ga., by Receiver N. H. Harris.

Myrtle Springs.—This company recently incorporated in Texas has the following first board of directors: Edgar A. Shaver, Pittsfield, Mass.; G. C. Rowley, Bland ford, Mass.; E. T. Casle, Pittsfield, Mass., and others.

New York Canadian Pacific.—At a meeting at Albany, N. Y., last week, these directors were elected: Joseph H. Ramsey, President; Minnard Harder, Vice-President; William S. Carman, Treasurer, and William L. M. Phelps, Secretary. Mr. Ramsey owns an old charter for a railroad through New York State to New York City and directors are occasionally elected to keep the charter in existence.

New York, Lake Erie & Western.—The headquarters of J. Deuel, Assistant General Freight Agent, have been changed to No. 177 Main street, Buffalo, N. Y. James Leeming, formerly Chief Clerk, has been appointed Assistant General Freight Agent, with headquarters at No. 21 Cortlandt street, New York City.

New York & New England.—Chas. H. Goodrich has been appointed General Freight Agent of the road, vice H. A. Hodge, resigned; and F. N. McClure is appointed General Agent of the Freight and Passenger Departments, with office at No. 353 Broadway, New York City.

New York, New Haven & Hartford.—C. C. Elwell, for the past year Engineer of Maintenance of Way of the Pittsburgh Division of the Baltimore & Ohio, has resigned to accept a similar position on the New York Division of the above road, with headquarters, at Stamford, Conn.

New York, Philadelphia & Norfolk.—The following is a list of the officers re-elected at the annual meeting: A. J. Cassatt, President; William A. Patton, Vice-President; William Cariss, Jr., Auditor and Secretary; J. G. Cassatt, Treasurer; H. W. Dunne, Superintendent; R. B. Cooke, General Passenger and Freight Agent.

Pennsylvania —At the annual meeting, held in Philadelphia, March 28th, 804,877 shares of stock were voted. The list of directors elected was published in our issue of March 24.

Pennsylvania Co.—S. P. Bush, who has been Master Mechanic of the Pennsylvania shops at Columbus, O., has been made Acting Superintendent of Motive Power in place of Edward B. Wall, promoted.

Philadelphia & Reading.—G. F. Randolph, First Assistant General Freight Agent, having resigned to accept the position of General Traffic Manager of the New York & New England, the office of First Assistant General Freight Agent has been abolished.

Pittsburgh, Wheeling & Kentucky.—At the annual meeting of the stockholders held at Wheeling, W. Va., last week, the following were elected directors. W. P. Hubbard, John McLure, Henry K. List, Joseph Speidell, of Wheeling, and Thomas D. Messler and James McCrea, of Pittsburgh.

Quaker City Elevated.—The Board of Directors of the Quaker City Elevated Railroad and the Northeastern Elevated of Philadelphia, which organizations have been consolidated, have elected Henry Whelen, Jr., Treasurer. He is a member of the banking firm of Townsend, Whelen & Co., of Philadelphia.

Richmond, Manchester & Middleburg.—This company, recently chartered by the Virginia Legislature, has organized with G. E. Fisher, President; F. G. Craigie, Secretary; and Charles Watkins, A. L. Adamson, W. W. Baker and John E. Taylor, Directors. The office is at Manchester, Va.

St. Louis & Ohio River.—At the stockholders' meeting at Golconda, Ill., the following officers and directors were elected: James Rose, President; H. Clanahan, Vice-President; W. P. Sloan, Solicitor; John Gilbert, Jr., Treasurer; T. McCoy, Secretary; directors, W. P. Sloan, Thomas McGowan, Penn V. Trovillon, James Rose, John Gilbert, Jr., T. R. Steagall, James A. Whitesides, Brice W. Lewis and H. Clanahan.

Texas & Pacific.—C. M. Babcock has been appointed Master Mechanic of the New Orleans division, with headquarters at Gouldsboro, La. Mr. Babcock was formerly foreman of machinery at Boyce, La.

Wagner Palace Car Co.—The following changes and promotions have been made: C. D. Flagg, General Manager, has been made Second Vice-President; John A Spoor, formerly Division Superintendent in Chicago, has taken the place of General Manager, and John C. Yage, has been made General Superintendent.

Wheeling Bridge & Terminal.—At the annual meeting of the company, held in Wheeling, W. Va., last week, the following directors were elected: C. O. Brewster, W. A. Wilson, N. E. Whitaker, W. B. Thomas, R. H. Stearns, A. H. Olmstead, J. K. Tod, R. H. Rochester and R. B. Ferris.

Wheeling & Lake Erie.—J. F. Townsend, formerly General Traffic Agent of the Cleveland, Lorain & Wheeling, at Steubenville, O., has been appointed Assistant General Freight Agent of this road, with office at Wheeling.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Austin & Northwestern.—The city of Austin and other towns along the route are making efforts which promise to be successful to secure the right of way for part of the proposed extension to Lampasas, Tex., and a subsidy, and as soon as the conditions have been complied with the company promises that it will begin building the line. The extension will be about 23 miles in length, extending from Burnet northeast in an almost direct line to Lampasas, which is the centre of an extensive mining district.

Baltimore & Lehigh.—Allison Bros., of Louisville and New York, have been awarded the contract for changing the gauge of this road to standard. The contract was let by the Baltimore Forwarding & Railroad Company, which is now operating the road, and it includes the work on the entire road from Baltimore to York, Pa., 79 miles. The work is to begin in April and the standard gauge line is to be ready by Sept. 1. The roadbed will be rebuilt at a number of points, many of the curves will be reduced and a number of the cuts filled in. The old bridges will be replaced by iron structures and the frame structures will also be replaced. It is said that the change of gauge will cost $300,000. Allison Bros. now have a contract on the Chicago drainage system, but they are moving most of their plant and men to Baltimore.

Birmingham, Sheffield & Tennessee River.—It is stated that negotiations looking to the extension of the road from Jasper to Birmingham, Ala., have been satisfactorily concluded. The extension will be about 40 miles in length. The preliminary survey of the route was made some months ago. The road has already been extended from Jasper to the Georgia Pacific road, about 12 miles in length. Negotiations have been concluded for building the extension to Birmingham, and work may be commenced at an early date.

Boise Railway & Terminal Co.—A charter for this company was secured in Idaho last week by D. E. Calvin, Superintendent of the Union Pacific; D. C. Lockwood, of Pocatello, Idaho, Attorney of the company, and other officers of the Union Pacific. The company proposes to build a bridge across the Boise River, and to extend the Union Pacific into the town of Boise, Idaho. Work will be commenced at once, so that the bridge can be built before high water in the river.

Bolivar & Kansas City.—This company has been incorporated in Missouri to build a road from Bolivar, Mo., to a point on the Kansas City, Clinton & Springfield between Aldrich and Humansville, Mo. R. B. Vilas, F. W. Adams and others of Bolivar, Mo., are directors.

Burlington & Missouri River.—The contractors have about 1,500 men now engaged on the Spearfish extension of this road which will be about 26 miles long. It starts from a point on the line to Deadwood, S. D., about eight miles east of that town and extends thence northeast through the Spearfish cañon to the town of Spearfish, S. D. About 20 miles of this is heavy mountain work with maximum curves of 16 degrees and maximum grades of four per cent. There is still from 1 to 3 ft. of snow on most of the line, but the men are working night and day on the heavy rock work. The contractors are Kilpatrick Brothers & Collinsof Lincoln, Neb., who have had the contract for nearly all the extensions of this road built in the last two or three years. The ore from the mines along Spearfish cañon will be hauled to a plant now being built at Spearfish, and there will also be a large cattle and grain traffic from that point.

Cape Fear & Yadkin Valley.—The stockholders at a special meeting at Fayetteville, N. C., on March 21, ratified the various amendments to the charter passed by the recent North Carolina Legislature. These amendments permit a consolidation or lease with any other company; authorize the directors to build various extensions and to issue new five per cent. mortgage bonds, to retire the present issues and to build new roads. It is understood that the company will soon complete the Cripple Creek extension to the Virginia State line connecting with a branch of the Norfolk & Western. This line was graded several years ago.

Cape May.—The engineers for the new Cape May Railroad from Landisville, N. J., have this week commenced to run the surveys from both Landisville and Cape May, and it is expected to complete this work in a few weeks. The projectors, among whom are Logan M. Bullitt, L. G. Thompson and D. R. Patterson, of 131 South Fourth street, Philadelphia, will then complete the organization of the company and secure the charter. The distance to Cape May, N. J., by the new line will be about 41 miles, connection being made at Landisville with the New Jersey Southern, operated by the Philadelphia & Reading. The projectors state that the road will be built during the summer.

Chesapeake & Ohio.—This company has engineers surveying for a branch line up Guyandotte River in West Virginia. The line upon which they are at work leaves the main line at Barboursville, and follows the east side of the river for some miles. Several surveys over practically the same route have been made in the past, but this is the first one that has been made by the railroad. The territory through which the line passes is a fine and at present undeveloped coal and timber country.

Chicago, Joliet & Southwestern.—Articles of incorporation were filed in Illinois this week. The new company proposes to build a road from Chicago to the Mississippi River near a point opposite Burlington, Ia. The capital stock is $5,000,000, and the incorporators and first directors are: J. E. Williams, Charles Maclin, George Wilson, W. B. Wilson and J. Lanning, all of Chicago.

Chicago, Rock Island & Pacific.—The contractors on the Texas line south of Bowie, Tex., are McCormick Brothers, J. A. Ware & Son, and the Bethune & Craney Construction Company. These firms have the contract for the grading on the first 50 miles south of Bowie, Tex., towards Fort Worth and Dallas, Tex. These are the only contracts for grading on the Texas extension which have been awarded this year. The engineers are still engaged on the surveys on the last 20 or 30 miles of the line, and it is understood that the company has not yet decided which town will be made the southern terminus of the road.

Creede & Gunnison.—A. H. Swan, of Ogden, Utah, is in New York City for the purpose of placing $200,000 worth of bonds of the company. The line has been located during the winter from Creede, Col., to the Amethyst mines, 12 miles, by C. A. King.

Delaware & Hudson Canal Company.—The building of a branch from the Adirondack Railroad, which is operated by this company, to Schroon Lake, N. Y., has been proposed. The whole matter, however, is merely under preliminary discussion and no location has been made. The branch if built will probably leave the Adirondack road at Riverside Station, a few miles southeast of North Creek, which is the northern terminus of the road, and will extend northeast to Schroon Lake, a distance of about 15 miles.

Denver & Rio Grande.—The Ruby-Anthracite branch, upon which construction was begun late last fall, extends westwardly from Crested Butte, 11 miles, to the new anthracite mines of the Colorado Fuel & Iron Co. The grading is being done by Levy & Moore, whose office is at Walsenburg, Col., and that work is probably one-fourth completed. On account of the deep snows the work is being carried on at a few rock cuts only, with a force of about 50 men. The track work has not been commenced

Detroit & Toledo Short Line.—This is the name of a company whose plans for a new railroad between Toledo and Detroit have been given a good deal of space in the columns of the local papers in Detroit and Toledo for the last two weeks. Marcus Pollasky, who went from Michigan two years ago to California and built 30 miles of the Fresno & Monterey Railroad, is the promoter of the project. It is announced that a preliminary survey for the line will be commenced this week by Milo H. Davis, of 55 West Fort street, Detroit, who has been appointed Chief Engineer.

Durham & Charlotte.—The incorporation of this company in North Carolina has already been noted, and the organization under the charter is now being completed. The chief promoters of the scheme are capitalists in Pennsylvania, and the object of the company is to connect Durham and Charlotte, N. C., both railroad centres and the most enterprising and progressive inland towns of North Carolina, by a nearly direct line. The distance between the towns is about 130 miles. This proposed road will extend through the counties of Durham, Chatham (via Gulf), Moore, Montgomery (via Troy), Star ley (via Albemarle), Cabarrus and Mecklenburg to Charlotte. The main object in building the road is to develop the coal, iron, mineral and timber interests along the line, and also connect by a short line the two railroad towns named. The company will absorb the railroad now under construction by the Glendon & Gulf Mining & Manufacturing Co., 10 miles of which has been graded and is ready for the track. The rails for this 10 miles have already been purchased and tracklaying will begin at once at Gulf, N. C. There are about 100 hands at work on this short branch. The work is not very difficult, the route being through a gently rolling hill country. The road will cross three rivers of considerable size, and the company will probably use wooden bridges instead of iron, as bridge timber can be easily obtained. Frank D. Jones, of Gulf, N. C., is the Engineer in Charge of the work, and George F. Edmiston, Gulf, N. C., is the General Manager.

Flint & Pere Marquette.—Various newspaper statements have been printed recently, alleging that work would soon begin on an extension of this road from Monroe, Mich., south to Toledo, O., 30 miles. A dispatch from New Bedford, Mass., the home of President W. W. Crapo, quotes him as stating that nothing definite has been done by the directors in regard to this extension. He says that it is under consideration, as it has been for several years, for that matter.

Florida Central & Peninsular.—The steel bridge of the line over the St. Mary's River is well under way. Tracklaying will be begun in a few days at four different points on the road between Hart's Roads, Fla., and Savannah, where a junction is made with the South Bound road. Although some delay in the grading has been occasioned by the heavy rains, there is every prospect that the road will be finished according to contract and opened to travel on Oct. 1 next.

Gladeville.—The recent report that the contract had been given out for building this road betweeu Gladeville and Wise Court House in the western part of Virginia, is an error. President E. M. Fulton, of Wise Court House, Va., states that the contract has not yet been let to any one.

Grand River & Mahoning.—The incorporation of this company in Ohio by James Ritchie, Thomas Deering and William L. Rice, of Cleveland, O., was noted in these columns last week. The road proposed by the company is to extend from Fairport on Lake Erie, or a point near that town on Grand River, southeast to Steubenville on the Ohio River, opposite Wheeling, W. Va. One newspaper report is that the new company may absorb the Lake Erie, Alliance & Southern in operation between Alliance to Bergholz, O., the latter town being less than 20 miles from Steubenville. The Ohio River, Smithfield & Lake Erie, whose incorporation was also noticed last week, proposes to build over a route which apparently would be parallel to this line. A survey has been made by James Ritchie, of Cleveland.

Gulf, Beaumont & Kansas City.—John H. Kirby, of Houston, the representative of the local projectors, is now on his way to Boston to confer with the Eastern directors of the company, E. E. Pratt, N. D. Silsbey and others of Boston. The company has just been chartered in Texas and proposes to build a road from Beaumont, on the Neuces River, north through the pine lands of eastern Texas and the building stone quarries in Jasper County to a point in the northern part of the latter county, about 70 miles from Beaumont. E. E. Pratt, of Boston, is President; J. H. Kirby, of Houston, General Manager; and W. C. Averill, of Beaumont, Secretary.

Hodgenville & Elizabethtown.—A survey for the proposed southern extension to Scottsville, Ky., has just been completed by J. C. Turner, the Chief Engineer, and the estimates are now being prepared. This is a long-proposed extension of the railroad, and the prospects for building it this year are reported to be quite favorable. The route proposed is from Hodgenville, the present terminus of the road, south via Glasgow to Scottsville, a distance of about 70 miles, connecting at the latter place with the Chesapeake & Nashville, so that the building of the new road will give a more direct line between Louisville and Nashville than the present route affords. The 11 miles of this road now built south of Elizabethtown are operated by the Newport News & Mississippi Valley Company, and if it is decided to build

to Scottaville this year, the financing for the work will probably be arranged by that company. Jacob Hubbard, of Hodgenville, is President of the local railroad.

Kansas City, Watkins & Gulf.—Preliminary surveys are being made from Bon Air south to a small town near Cameron on the Gulf of Mexico, near Calcasieu Pass, a distance of about 30 miles. Bon Air is a station on the present line, about 13 miles east of Lake Charles, the terminus of the road. In addition to the survey already mentioned the Chief Engineer, P. H. Philbrick, of Lake Charles, La., is running a line from that town southeast to a point on Lacasine Bayou, a distance of about eight miles, and work on this line will probably begin early in summer. Lacasine Bayou is navigable for large barges and has an outlet to the Gulf of Mexico by the Mermenteau River, a navigable steam. The building of this short branch will secure for the road traffic from a large section of prairie land south of the line of the Southern Pacific, which is drained by a number of navigable streams, all connecting with Lacassine Bayou. The line to Calcasieu Pass will probably also be built this year, but the contracts will not be let before summer.

Lackawanna, Catskill Mountain & Boston.—An application has been made by the projectors of this line to the New York State Railroad Commission for authority to build a line from Deposit, N. Y., to Schenectady, and several hearings have been given by the Commissioners, but decision has been reserved. At the hearing this week the application was opposed by General Manager Childs, of the New York, Ontario & Western and the Delaware & Hudson Canal Co. The argument for the projectors was made by Benjamin S. Harmon, of New York City. A preliminary survey of the line was made during the winter from Deposit, N. Y., on the Delaware River, near the Pennsylvania State line, northeast, following the Delaware River to its headwaters, and thence through Schoharie Valley to the town of Schoharie, and to Schenectady, N. Y., about 135 miles.

Manitoulin & North Shore.—The engineers have completed their location and are now preparing plans and profiles. The road is to extend from the town of Little Current, Ont., on the Grand Manitoulin in a northeasterly direction to Nelson Station, on the Sault branch of the Canadian Pacific, a distance of 40 miles. The bridge between the mainland and island will be 450 ft. long This road has promises of aid from the Provincial and Dominion governments to the extent of $6,200 a mile for 30 miles of road.

Mexican Southern.—This road will be delivered to the operating company by the contractors, Messrs. Read & Campbell, on April 1. Mr. Walter Morcom will remain as General Manager, the same office that he has filled under the contractors for the past year.

Mexico, Cuernavaca & Pacific.—Construction was commenced with a considerable force near the City of Mexico this month, and will be pushed as rapidly as possible by the new officers. General Manager D. B. Smith is in charge of the work.

Midland Rapid Transit.—This company filed articles of incorporation at Springfield, Ill., on March 27. It is proposed to build an elevated road from a point in the First Ward in Chicago to the western limits, with a branch between Crawford and Western avenues, in a northwesterly direction to the western limits of Chicago. A second branch will extend from a point between Center avenue and Canal street in a northerly and northwesterly direction to the western limits of the city, and a third branch from a point between Canal street and Center avenue to the southern limits of the city, while a fourth branch will extend east to the lake. The incorporators and directors are: George M. Eckels, H. Hulbut, P. James Costello, Royal F. Wilde and John S. Perry.

Missouri, Kansas & Eastern.—All the track is now laid on this road from New Franklin, where a junction is made with the Missouri, Kansas & Texas Railroad, east along the north bank of the Missouri River to St. Charles, Mo. Most of this work was completed last year, but about 46 miles of the track has been built in 1893 between New Franklin and North Jefferson, Mo. The entire line is about 134 miles long and is nearly all ballasted east from North Jefferson to St. Charles. The ballasting on the west section and the erection of the stations, fencing, etc., will be completed in April, and it is expected that the company will be running through passenger trains into St. Charles over the new line during that month.

Ohio Southern.—Grading on the extension to Lima, O., was begun at that town last week, the company having finally secured the right of way into that city and land for terminal facilities. McArthur Bros. & Co., of Chicago, have the contract for building the line, which will be 60 miles long, and they have been working at Springfield for some months, and have, perhaps, nearly half of the work completed.

Ontario & Rainy River.—James Conmee, M. P. P., of Port Arthur, Ont., states that a road is projected under the above name from Port Arthur to Sturgeon Falls, which is 200 miles to the southwest. The country to be traversed is good agricultural land and the Huronian gold range and the Aticokan iron range will be on this route. The promoters will ask for government grants. Mr. Conmee is a member of the firm of Middleton & Conmee, which built the Port Arthur, Duluth & Western.

Philadelphia & Reading.—The iron bridge over Franklin street in Frankford was erected last week, bringing the work on this branch to within one square of its terminus in that town. The temporary structures across other streets are now being replaced with iron bridges and the track will then be laid and ballasted and the branch completed by Aug. 1, when it is expected that the station in Frankford will be erected. The branch is three miles long from Crescentville, near Philadelphia, to Frankford.

Point Pleasant, Buckhannon & Tygarts Valley.—This company has a corps of engineers in the field under James Mullins, Chief Engineer, making a preliminary survey for a route between Buckhannon, W. Va., and the West Virginia Central & Pittsburg road. The engineers ran a line from Buckhannon to the mouth of the Laurel river in Barbour County, a distance of about 11 miles, last week. This route has grades of 100 ft. to the mile. Two other routes between the same points are to be surveyed, one of which it is thought will prove more advantageous. As has been stated, the line is to be a connecting link between the West Virginia & Pittsburgh and West Virginia Central & Pittsburgh railroads, but is being built by local capital.

Sandusky & Columbus Short Line.—The injunction suits which the Lake Shore & Michigan Southern, the Cleveland, Cincinnati, Chicago & St. Louis and the Baltimore & Ohio commenced some four months ago, to prevent the city of Sandusky, O., issuing bonds to build docks for this road, have been dismissed, and the work will proceed. The officers announce that the line will be open for traffic on April 1. The company has not yet completed its own terminal at Sandusky, and until this is done it is understood that it will use those of the "Big Four." The line from Sandusky to Columbus is 110 miles long.

Toledo & Ohio Central.—J. S. Casement & Co.. of Painesville, O., have recently been awarded the contract for the extension of this line to Columbus, O., as reported last week. The work has just commenced and the headquarters of the contractors will probably be at Marysville O., for the present. The contract includes no heavy work and the grades and curves of the entire line are light. Only two iron bridges will be necessary. The extension begins at Ridgeway, O., to which point the road was extended in 1891, and it has been located through the towns of West Mansfield, Newton. Peoria and Marysville to Columbus, a distance of 60 miles.

Wilmington, Onslow & East Carolina.—The track-laying on the extension from Jacksonville, northeast to New Berne, is nearing completion, and the rails are now laid for nearly 20 miles to Maysville, a town a few miles from the Craven County line, of which New Berne is the county seat. The extension is about 38 miles long.

GENERAL RAILROAD NEWS.

Chattanooga Southern.—Joseph W. Burke, Receiver, will sell the railroad at foreclosure at Chattanooga, Tenn., on. May 1. The sale is ordered by the United States Circuit Court, to satisfy a judgment secured by the Central Trust Co., of New York. The road extends from Chattanooga south to Gadsden, Ala., a distance of 92 miles, and has been in the hands of a Receiver since February 1892.

Chicago, Burlington & Quincy.—The following table shows the earnings for February:

February:	1893.	1892.	Inc. or dec.	
Gross earn	$2,982,236	$3,068,385	D.	$86,151
Oper. expen	2,043,423	1,985,499	I.	57,923
Net earn	$938,813	$1,082,886	D.	$144,074
Fixed charges	830,000	815,075	I.	14,924
Surplus	$108,813	$267,811	D.	$158,998
Two months to Feb. 28:				
Gross earn	$6,034,529	$6,077,184	D.	$42,655
Oper. expen	4,248,762	4,054,709	I.	194,052
Net earn	$1,785,767	$2,022,475	D.	$236,707
Fixed charges	1,660,000	1,630,150	I.	29,849
Surplus	$125,767	$392,325	D.	$266,556

Macon & Northern.—N. E. Harris, of Macon, Ga., was this week appointed temporary receiver of the railroad. The appointment was the result of a bill filed in the United States Court by the Baltimore bondholders asking that the road be placed in hands other than those of Receiver Comer, of the Central of Georgia, because of that company's default in the payment of interest on the bonds of the road.

New York, Lake Erie & Western.—The earnings and expenses of this company for the month of February, and the three months to Feb. 28, are given in the following table:

Month of February.	1893.	1892.	Inc. or Dec.	
Gross earnings	$2,100,432	$2,278.622	D.	$178,140
Operating expenses	1,460,841	1,619,856	D.	159,015
Balance	$639,691	$658,766	D.	$19,125
Rentals	179,456	207,038	D.	27,582
Net earnings	$460,235	$451,728	I.	$8,457
Oct. 1 to Feb. 28.				
Gross earnings	$12,176,216	$12,664,924	D.	$188,708
Operating expenses	8,256.902	8,839,502	D.	582,600
Balance	$3,919,314	$3,825,422	I.	$93,892
Rentals	1,099,095	1,104,552	D.	5,457
Net earnings	$2,820,219	$2,720,870	D.	$99,34

Northern Pacific.—At a meeting of the directors last week, it is announced that the Board decided not to dispose of the company's holdings of the stock of the St. Paul & Northern Pacific Railroad, and the meeting of the stockholders, called for April 20, to consider amendments to the lease of the St. Paul & Northern Pacific will not be held. The stock of that railroad was to be offered to stockholders, the funds received by its sale to be used to pay off its floating debt. This plan for the settlement of the floating debt has been opposed by the stockholders' investigating committee. This committee has suggested that the company should issue collateral trust notes on the pledge of securities in the Treasury. It is proposed that the company issue $12,000,000 collateral trust notes, to run for five years at six per cent. interest, to take up the present floating obligations of the company. The floating debt is said to amount to $9,000,000, and the difference between that sum and the gross amount of the proposed notes is to be expended in future improvements. President Thomas F. Oakes said this week that the company would fund the floating debt, but in exactly what manner the officers have not yet determined. They have for some time been considering a plan to issue for that purpose collateral trust notes. The debt matures at dates varying from Sept. 1 to Dec. 31. The matter may be decided at the next meeting of the Board of Directors on April 20.

Pennsylvania.—The statement of earnings of Eastern lines for February is given in the following table:

	1893.	1892.	Inc. or dec	
Gross earn	$5,137,039	$5,217,098	D.	$80,059
Oper. expen	3,900,678	3,645,166	I.	255,512
Net earn	$1,236,361	$1,571,932	I.	$335,571

Net earnings in 1891 were $1,308,970, and in 1890, $1,395,132.

The Western lines show for the month a gross decrease of $203,944 and a net decrease of $419,796. This makes for the system for February a gross decrease of $284,003 and a net decrease of $755,367.

For two months Eastern lines show:

Gross earn	$10,078,282	$10,254,836	D.	$176,554
Oper. expen	8,341,720	7,608,356	I.	733,264
Net earn	$1,736 562	$2,646,480	D.	$909,818

The gross earnings of Western lines in two months decreased $259,726 and net earnings decreased $674,066, making for the system a gross decrease of $436,280 and a net decrease of $1,346,098.

Philadelphia & Reading.—Messrs. Drexel & Co. and Brown Brothers & Co., of New York, have arranged with the Receivers to purchase the coupons of the improvement mortgage due April 1, amounting to $280,920, and also the coupons the interest of the consolidated mortgage six and seven per cent. bonds due June 1, amounting to $617,575.

Seattle, Lake Shore & Eastern.—A suit has been filed at Seattle, Wash., by a local stockholder to annul the lease of the road to the Northern Pacific and to have a receiver appointed. In regard to the application for the appointment of a receiver, the counsel for the Northern Pacific in New York City says: "The application is based principally upon the ground that the traffic contract under which the road is operated by the Northern Pacific is not favorable enough to the Seattle road. The complaint made by the stockholders' committee was that the traffic contract was too favorable to the Seattle road. My own judgment is that this suit is instigated by the enemies of the proposed line from Vancouver to a connection with the Seattle, Lake Shore & Eastern at Sumas, Wash., which is chartered as the Burrard Inlet & Fraser River Valley. If they can secure the appointment of a receiver, they can prevent the making of a contract for exchange of business at the boundary.

Southern Pacific.—The first land decision of Secretary Smith, of the Interior Department, made this week, involved the question of the right of this company to lands within its granted limits and the limits of the grant to the Atlantic & Pacific, basing its claim on the ground that the latter company never complied with its requirements of grant in the matter of locating its road and the forfeiture of its grant in 1886. The Secretary holds, however, that the Southern Pacific had acquired no title to the lands in question under its grant. This decision operates to open many thousands of acres in Southern California to settlement and entry.

Tennessee Coal, Iron & Railroad Co.—John H. Inman, of New York, has bought 25,000 shares of the company's stock from H. De Bardeleben, of Birmingham, Ala., who agrees not to sell the rest of the stock held by him, amounting to 40,000 shares, for sixty days. At the annual meeting of the company, to be held on April 4, Nathaniel Baxter, of Nashville, wil probably be elected President, and Mr. De Bardeleben Vice-President and General Manager. The price paid for the stock was about 25.

TRAFFIC.

Traffic Notes.

A New Orleans firm recently shipped 10 carloads of bananas to the Pacific Coast in two days.

Shipments of corn to Mexico by rail have again become heavy, the duty on corn having been removed by the Mexican Government March 15.

The general and commercial freight agents of Colorado have organized an association, with headquarters at Denver. Meetings will be held semi-monthly. P. J. Flynn is Chairman.

The Weighing and Inspection Bureau of the Central Traffic Association has made its annual report, which is said to show that during 1892 the saving effected by the bureau was $750,000.

Press dispatches report that merchants at Panama are complaining loudly over the high freight rates charged by the Panama Railroad since the expiration of the contract with the Pacific Mail Steamship Company.

On Wednesday of this week the trunk lines and central traffic roads, at a meeting in New York, voted to rescind the recent decision allowing stop-overs on reduced rate tickets to the World's Fair, and also voted not to issue one-way tickets at reduced rates. It was feared that the stop-over business would seriously demoralize local rates.

It is announced that the New York, Ontario & Western will establish a line of steamers between Duluth and Oswego. It is expected to get a profitable grain business east bound and to carry anthracite coal westward. The line of this road from Oswego to New York is 325 miles long, with unfavorable grades. From Scranton, where the coal is shipped, to Oswego, the distance is 219 miles.

The Interstate Commerce Commission is pressing its suit in the United States Court against the Lehigh Valley to enforce the decision of the Commission in the case of Coxe Brothers & Company against that road. Coxe Brothers & Company have now lost interest in the matter, as they have made a contract with the Philadelphia & Reading. The Commission is also taking further action in the case of Haddock against the Delaware, Lackawanna & Western. Both these cases concern the reasonableness of rates on anthracite coal from the mines to tide water.

Chicago Traffic Matters.

CHICAGO, March 29, 1893.

The Chicago as well as the Eastern lines are still wrestling with the question of rates to the World's Fair. The managers of the Central Traffic Association have adopted the following rates between Pittsburgh and Chicago: Round trip, via Pennsylvania lines, $18; via Baltimore and Ohio, $16; one way via Pennsylvania, $10; via Baltimore & Ohio, $9. The question of what reduction, if any, should be made for one-way traffic, was referred to the Joint Committee, as was also the question of round-trip tickets from Chicago.

The Western roads met again Monday and endeavored to arrive at an understanding on the matter of rates for the Fair, but as yet have not finally disposed of the matter. Two things are evident; one is, that the roads are by no means united in the matter, and the other is, that they are afraid the scalpers will do all the one-way business if they make any material reductions. The St Louis lines are determined to get some of the business, and this adds further to the complications. A prominent ticket agent told me to-day that he knew that contracts were now being made for fare-one-way, and he felt confident that that was what would eventually be done by the roads for all except limited trains.

Chairman Midgley, of the Western Freight Association, is suffering with nervous prostration.

The plan for amalgamating the Western Freight and Trans-Missouri associations have fallen through. The lines are seriously considering the advisability of re-establishing the latter association. Everybody claims that the roads are getting along just as well as when the Western Traffic, the Trans-Continental and Trans-Missouri associations were in operation, but it is an open secret that the reason is that each is attending strictly to its own method of getting traffic, and so long as there is traffic enough to go round no one is complaining. If one line falls behind, its agents increase their "efforts" and pick up a little more business. How long this can continue without collapse is problematical.